EPA United States Environmental Protection Agency

Healthcare Environmental Assistance Resources

Pollution Prevention and Compliance Assistance for Healthcare Facilities

United States Environmental Protection Agency
Office of Solid Waste and Emergency Response (5104)
EPA 550-B-01-003
October 2001
www.epa.gov/ceppo

LIST OF LISTS

Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-To-Know Act (EPCRA) and Section 112(r) of the Clean Air Act

- EPCRA Section 302 Extremely Hazardous Substances
- CERCLA Hazardous Substances
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LIST OF LISTS
Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-to-Know Act (EPCRA) and Section 112(r) of the Clean Air Act

This consolidated chemical list includes chemicals subject to reporting requirements under the Emergency Planning and Community Right-to-Know Act (EPCRA), also known as Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA)[1], and chemicals listed under section 112(r) of the Clean Air Act (CAA). This consolidated list has been prepared to help firms handling chemicals determine whether they need to submit reports under sections 302, 304, or 313 of EPCRA and, for a specific chemical, what reports may need to be submitted. It will also help firms determine whether they will be subject to accident prevention regulations under CAA section 112(r). Separate lists are also provided of Resource Conservation and Recovery Act (RCRA) waste streams and unlisted hazardous wastes, and of radionuclides reportable under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). These lists should be used as a reference tool, not as a definitive source of compliance information. Compliance information for EPCRA is published in the Code of Federal Regulations (CFR), 40 CFR Parts 302, 355, and 372. Compliance information for CAA section 112(r) is published in 40 CFR Part 68. This document is also available in a searchable database format at http://www.epa.gov/ceppo/ap-otgu.htm.

The chemicals on the consolidated list are ordered both by the Chemical Abstracts Service (CAS) registry number and alphabetically. For the list ordered by CAS number, categories of chemicals which generally do not have CAS registry numbers, but which are cited under CERCLA, are placed at the front of the list. EPCRA section 313 categories are placed at the end of the list with their 313 category code.

The lists include chemicals referenced under five federal statutory provisions, discussed below. More than one chemical name may be listed for one CAS number because the same chemical may appear on different lists under different names. For example, for CAS number 8001-35-2, the names toxaphene (from the section 313 list), camphechlor (from the section 302 list), and camphene, octachloro- (from the CERCLA list) all appear on this consolidated list. The chemical names on the consolidated lists generally are those names used in the regulatory programs developed under EPCRA, CERCLA, and CAA section 112(r), but each chemical may have other synonyms that do not appear on these lists.

(1) EPCRA Section 302 Extremely Hazardous Substances (EHSs)

The presence of EHSs in quantities at or above the Threshold Planning Quantity (TPQ) requires certain emergency planning activities to be conducted. The extremely hazardous substances and their TPQs are listed in 40 CFR Part 355, Appendices A and B. For section 302 EHSs, Local Emergency Planning Committees (LEPCs) must develop emergency response plans and facilities must notify the State Emergency Response Commission (SERC) and LEPC if they receive or produce the substance on site at or above the EHS's TPQ. Additionally if the TPQ is met, facilities with a listed EHS are subject to the reporting requirements of EPCRA section 311 (provide material safety data sheet or a list of covered chemicals to the SERC, LEPC, and local fire department) and section 312 (submit inventory

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[1] This consolidated list does not include all chemicals subject to the reporting requirements in EPCRA sections 311 and 312. These hazardous chemicals, for which material safety data sheets (MSDS) must be developed under the Hazard Communication Standard (29 CFR 1910.1200), are identified by broad criteria, rather than by enumeration. There are over 500,000 products that satisfy the criteria. See 40 CFR Part 370 for more information.

form - Tier I or Tier II). The minimum threshold for section 311-312 reporting for EHS substances is 500 pounds or the TPQ, whichever is less.

TPQ. The consolidated list presents the TPQ (in pounds) for section 302 chemicals in the column following the CAS number. For chemicals that are solids, there may be two TPQs given (e.g., 500/10,000). In these cases, the lower quantity applies for solids in powder form with particle size less than 100 microns, or if the substance is in solution or in molten form. Otherwise, the 10,000 pound TPQ applies.

EHS RQ. Releases of reportable quantities (RQ) of EHSs are subject to state and local reporting under section 304 of EPCRA. EPA has promulgated a rule (61 FR 20473, May 7, 1996) that adjusted RQs for EHSs without CERCLA RQs to levels equal to their TPQs. The EHS RQ column lists these adjusted RQs for EHSs not listed under CERCLA and the CERCLA RQs for those EHSs that are CERCLA hazardous substances (see the next section for a discussion of CERCLA Rqs).

Note that ammonium hydroxide is not covered under section 302; the EHS RQ is based on anhydrous ammonia. Ammonium hydroxide (which is also known as aqueous ammonia) is subject to CERCLA, with its own RQ.

(2) <u>**CERCLA Hazardous Substances**</u>

Releases of CERCLA hazardous substances, in quantities equal to or greater than their reportable quantity (RQ), are subject to reporting to the National Response Center under CERCLA. Such releases are also subject to state and local reporting under section 304 of EPCRA. CERCLA hazardous substances, and their reportable quantities, are listed in 40 CFR Part 302, Table 302.4. Radionuclides listed under CERCLA are provided in a separate list, with RQs in Curies.

RQ. The CERCLA RQ column in the consolidated list shows the RQs (in pounds) for chemicals that are CERCLA hazardous substances. Carbamate wastes under RCRA that have been added to the CERCLA list with statutory one-pound RQs are indicated by an asterisk ("*") following the RQ.

Metals. For metals listed under CERCLA (antimony, arsenic, beryllium, cadmium, chromium, copper, lead, nickel, selenium, silver, thallium, and zinc), no reporting of releases of the solid form is required if the mean diameter of the pieces of the solid metal released is greater than 100 micrometers (0.004 inches). The RQs shown on the consolidated list apply to smaller particles.

Note that the consolidated list does not include all CERCLA regulatory synonyms. See 40 CFR Part 302, Table 302.4 for a complete list.

There have been a few additions and deletions to Table 302.4 since this document was last updated (November 1998). Hazardous wastes K174 and K175 have been added to this list. Removed from Table 302.4 are caprolactam (CAS 105-60-2), 2,4,6-tribromophenol (CAS 118-79-6), and K140 floor sweepings, off-specification products and spent filtermedia from the production of 2,4,6-tribromophenol.

(3) **CAA Section 112(r) List of Substances for Accidental Release Prevention**

Under the accident prevention provisions of section 112(r) of the CAA, EPA developed a list of 77 toxic substances and 63 flammable substances. Threshold quantities (TQs) were established for these substances. The list and TQs identify processes subject to accident prevention regulations. The list of substances and TQs and the requirements for risk management programs for accidental release prevention are found in 40 CFR Part 68. This consolidated list includes both the common name for each listed chemical under section 112(r) and the chemical name, if different from the common name, as separate listings.

The CAA section 112(r) list includes several substances in solution that are covered only in concentrations above a specified level. These substances include ammonia (concentration 20% or greater) (CAS number 7664-41-7); hydrochloric acid (37% or greater) (7647-01-0); hydrogen fluoride/hydrofluoric acid (50% or greater) (7664-39-3); and nitric acid (80% or greater) (7697-37-2). Hydrogen chloride (anhydrous) and ammonia (anhydrous) are listed, in addition to the solutions of these substances, with different TQs. Only the anhydrous form of sulfur dioxide (7446-09-5) is covered. These substances are presented on the consolidated list with the concentration limit or specified form (e.g., anhydrous), as they are listed under CAA section 112(r). Flammable fuels used as a fuel or held for sale as a fuel at a retail facility are not subject to the rule.

TQ. The CAA section 112(r) TQ column in the consolidated list shows the TQs (in pounds) for chemicals listed for accidental release prevention. The TQ applies to the quantity of substance in a process, not at the facility as a whole.

(4) **EPCRA Section 313 Toxic Chemicals**

Emissions, transfers, and waste management data for chemicals listed under section 313 must be reported annually as part of the community right-to-know provisions of EPCRA (40 CFR Part 372).

Section 313. The notation "313" in the column for section 313 indicates that the chemical is subject to reporting under section 313 and section 6607 of the Pollution Prevention Act under the name listed. In cases where a chemical is listed under section 313 with a second name in parentheses or brackets, the second name is included on this consolidated list with an "X" in the section 313 column. An "X" in this column also may indicate that the same chemical with the same CAS number appears on another list with a different chemical name. Since the last updating of the list in November 1998, a number of reporting thresholds have changed. These include reporting thresholds for 18 chemicals that meet the EPCRA section 313 criteria for persistence and bioaccumulation, as well as lead and lead compounds (except lead contained in stainless steel, brass, and bronze alloys). Chemicals that have had reporting thresholds changed are marked with a “ ^ ” symbol on the list. The revised thresholds are listed at the end of this section.

Diisocyanates, Dioxins and Dioxin-like Compounds, and PACs. In the November 30, 1994, expansion of the section 313 list, 20 specific chemicals were added as members of the diisocyanate category, and 19 specific chemicals were added as members of the polycyclic aromatic compounds (PAC) category. In October 1999, EPA added a category of dioxin and dioxin-like compounds that includes 17 specific chemicals. These chemicals are included in the CAS order listing on this consolidated list. The symbol "#" following the "313" notation in the section 313 column identifies diisocyanates, the symbol “!” identifies the dioxin and dioxin-like compounds, and the symbol "+"

identifies PACs, as noted in the Summary of Codes. Chemicals belonging to these categories are reportable under section 313 by category, rather than by individual chemical name.

Ammonium Salts. The EPCRA section listing for ammonia includes the following qualifier "includes anhydrous ammonia and aqueous ammonia from water dissociable ammonium salts and other sources; 10 percent of total aqueous ammonia is reportable under this listing". The qualifier for ammonia means that anhydrous forms of ammonia are 100% reportable and aqueous forms are limited to 10% of total aqueous ammonia. Therefore, when determining threshold and releases and other waste management quantities all anhydrous ammonia is included but only 10% of total aqueous ammonia is included. Any evaporation of ammonia from aqueous ammonia solutions is considered anhydrous ammonia and should be included in threshold determinations and release and other waste management calculations.

In this document ammonium salts are not specifically identified as being reportable EPCRA section 313 chemicals. However, water dissociable ammonia salts, such as ammonium chloride, are reportable if they are placed in water. When ammonium salts are placed in water, reportable aqueous ammonia is manufactured. As indicated in the ammonia qualifier, all aqueous ammonia solutions from water dissociable ammonium salts are covered by the ammonia listing. For example, ammonium chloride is a water dissociable ammonium salt and reportable aqueous ammonia will be manufactured when it is placed in water.

Unlike other ammonium salts, ammonium hydroxide is specifically identified as being a reportable EPCRA section 313 chemical. This is because the chemical ammonium hydroxide (NH4OH) is a misnomer. It is a common name used to describe a solution of ammonia in water (i.e., aqueous ammonia), typically a concentrated solution of 28 to 30 percent ammonia. EPA has consistently responded to questions regarding the reportability of these purported ammonium hydroxide solutions under the EPCRA Section 313 ammonia listing by stating that these are 28 to 30 percent solutions of ammonia in water and that the solutions are reportable under the EPCRA Section 313 ammonia listing. For a more detailed discussion, see page 34175 of the Federal Register final rule of June 30, 1995 (60 FR 34172). (See also EPA's EPCRA section 313, *Guidance for Reporting Aqueous Ammonia*, EPA 745-R-00-005, www.epa.gov/TRI)

Additions. Added to the list of toxic chemicals subject to reporting under EPCRA section 313 are seven chemicals and two chemical compound categories. These are:

Chemicals

	CAS
1) benzo(g,h,i)perylene	191242
2) benzo(j,k)fluorine (as a member of the PACs category)	206440
3) 3-methylcholanthrene (as a member of the PACs category)	56495
4) octachlorostyrene	29082744
5) pentachlorobenzene	608935
6) tetrabromobisphenol A	79947
7) vandium (except when contained in an alloy)	7440622

Chemical Categories

	Category Code
1) vandium compounds	N770

Stayed Chemicals. There are three EPRCA section 313 chemicals that are listed in the CFR but for which the Agency has issued an administrative stay that excludes them from reporting until the stays are lifted. These chemicals, identified by “313s” in the Sec. 313 table column, are methyl mercaptan (CAS number 74-93-1), hydrogen sulfide (CAS number 7783-06-4), and 2,2-dibromo-3-nitrilopropionamide (CAS number 10222-01-2). Check the TRI website (www.epa.gov/triexplorer) for updated regulatory information.

TRI Thresholds. Reporting under EPCRA section 313 is triggered by the quantity of a chemical that is manufactured, processed, or otherwise used during the calendar year. For most TRI chemicals, the thresholds are 25,000 pounds manufactured or processed or 10,000 pound otherwise used. EPA has recently lowered the reporting thresholds for certain chemicals and chemical categories that meet the criteria for persistence and bioaccumulation. The following list provides the thresholds for these chemicals(in pounds unless otherwise noted):

Chemical Name or Category	**CAS Number**	**Threshold (lbs)**
Aldrin	309-00-2	100
Benzo(g,h,i)perylene	191-24-2	10
Chlordane	57-74-9	10
Dioxin and dioxin-like compound category (manufacturing; and processing or otherwise use of dioxin and dioxin-like compounds if they are present as contaminants in a chemical and if they were created during the manufacture of that chemical)	NA	0.1 gram
Heptachlor	76-44-8	10
Hexachlorobenzene	118-74-1	10
Isodrin	465-73-6	10
Lead and lead compounds except lead contained in stainless steel, brass, and bronze alloys (applies to reporting for 2001(due July 2002) and later)	NA	100
Methoxychlor	72-43-5	100
Octachlorostyrene	29082-74-4	10
Pendimethalin	40487-42-1	100
Pentachlorobenzene	608-93-5	10
Polycyclic aromatic compounds category	NA	100
Polychlorinated biphenyls (PCBs)	1336-36-3	10

Tetrabromobisphenol A	79-94-7	100
Toxaphene	8001-35-2	10
Trifluralin	1582-09-8	100
Mercury	7439-97-6	10
Mercury compounds	NA	10

(5) **Chemical Categories**

The CERCLA and EPCRA section 313 lists include a number of chemical categories as well as specific chemicals. Categories appear on this consolidated list at the end of the CAS number listing. Specific chemicals listed as members of the diisocyanates, dioxin and dioxin-like compounds, and PAC categories under EPCRA section 313 (see section (4) above) are included in the list of specific chemicals by CAS number, not in the category listing. The chemicals on the consolidated list have not been systematically evaluated to determine whether they fall into any of the CERCLA listed categories, but EPA has attempted to identify those listed chemicals that are clearly reportable under one or more of the EPCRA section 313 categories.

Some chemicals not specifically listed under CERCLA may be subject to CERCLA reporting as part of a category. For example, strychnine sulfate (CAS number 60-41-3), listed under EPCRA section 302, is not individually listed on the CERCLA list, but is subject to CERCLA reporting under the listing for strychnine and salts (CAS number 57-24-9), with an RQ of 10 pounds. Similarly, nicotine sulfate (CAS number 65-30-5) is subject to CERCLA reporting under the listing for nicotine and salts (CAS number 54-11-5, RQ 100 pounds), and warfarin sodium (CAS number 129-06-6) is subject to CERCLA reporting under the listing for warfarin and salts, concentration >0.3% (CAS number 81-81-2, RQ 100 pounds). Note that some CERCLA listings, although they include CAS numbers, are for general categories and are not restricted to the specific CAS number (e.g., warfarin and salts). The CERCLA list also includes a number of generic categories that have not been assigned RQs; chemicals falling into these categories are considered CERCLA hazardous substances, but are not required to be reported under CERCLA unless otherwise listed under CERCLA with an RQ.

A number of chemical categories are subject to EPCRA section 313 reporting. Certain chemicals listed under EPCRA section 302, CERCLA, or CAA section 112(r) may belong to section 313 categories. For example, mercuric acetate (CAS number 1600-27-7), listed under section 302, is not specifically listed under section 313, but is reportable under the section 313 "Mercury Compounds" category (no CAS number). Listed chemicals that have been identified as being reportable under one or more EPCRA section 313 categories are identified by “313c” in the Sec. 313 table column.

(6) **RCRA Hazardous Wastes**

The consolidated list includes specific chemicals from the RCRA P and U lists only (40 CFR 261.33). This listing is provided as an indicator that companies may already have data on a specific chemical that may be useful for EPCRA reporting. It is not intended to be a comprehensive list of RCRA P and U chemicals. RCRA hazardous wastes consisting of waste streams on the F and K lists, and wastes exhibiting the characteristics of ignitability, corrosivity, reactivity, and toxicity, are provided in a separate list. This list also includes carbamate wastes added to the CERCLA list with one-pound statutory RQs (indicated by an asterisk ("*") following the RQ). The descriptions of the F and K waste streams have been abbreviated; see 40 CFR Part 302, Table 302.4, or 40 CFR Part 261 for complete descriptions.

RCRA Code. The letter-and-digit code in the RCRA Code column is the chemical's RCRA hazardous waste code.

Summary of Codes

^ Reporting threshold has changed since November 1998.
+ Member of PAC category.
# Member of diisocyanate category.
X Indicates that this is a second name for a chemical already included on this consolidated list. May also indicate that the same chemical with the same CAS number appears on another list with a different chemical name.
* RCRA carbamate waste; statutory one-pound RQ applies until RQs are adjusted.
** This chemical was identified from a Premanufacture Review Notice (PMN) submitted to EPA. The submitter has claimed certain information on the submission to be confidential, including specific chemical identity.
*** Indicates that no RQ is assigned to this generic or broad class, although the class is a CERCLA hazardous substance. See 50 *Federal Register* 13456 (April 4, 1985). Values in Section 313 column represent Category Codes for reporting under Section 313.
c Although not listed by name and CAS number, this chemical is reportable under one or more of the EPCRA section 313 chemical categories.
s Indicates that this chemical is currently under an administrative stay of the EPCRA section 313 reporting requirements, therefore, no Toxics Release Inventory reports are required until the stay is removed.
! Member of the dioxin and dioxin-like compounds category.

LIST OF LISTS
CONSOLIDATED LIST OF CHEMICALS (BY CAS NUMBER) SUBJECT TO THE EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT (EPCRA) AND SECTION 112(r) OF THE CLEAN AIR ACT

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Chlordane (Technical Mixture and Metabolites)	0			***			
Chlorinated Benzenes	0			***			
Chlorinated Ethanes	0			***			
Chlorinated Naphthalene	0			***			
Chloroalkyl Ethers	0			***			
Coke Oven Emissions	0			1			
DDT and Metabolites	0			***			
Dichlorobenzidine	0			***			
Diphenylhydrazine	0			***			
Endosulfan and Metabolites	0			***			
Endrin and Metabolites	0			***			
Fine mineral fibers	0			***			
Haloethers	0			***			
Halomethanes	0			***			
Heptachlor and Metabolites	0			***			
Nitrophenols	0			***			
Nitrosamines	0			***			
Organorhodium Complex (PMN-82-147)	0	10/10,000	10	**			
Phthalate Esters	0			***			
Polycyclic organic matter	0			***			
Polynuclear Aromatic Hydrocarbons	0			***			
Formaldehyde	50-00-0	500	100	100	313	U122	15,000
Formaldehyde (solution)	50-00-0	500	100	100	X	U122	15,000
Mitomycin C	50-07-7	500/10,000	10	10		U010	
Ergocalciferol	50-14-6	1,000/10,000	1,000				
Cyclophosphamide	50-18-0			10		U058	
DDT	50-29-3			1		U061	
Benzo[a]pyrene	50-32-8			1	313+^	U022	
Reserpine	50-55-5			5,000		U200	
Piperonyl butoxide	51-03-6				313		
5-Fluorouracil	51-21-8	500/10,000	500		X		
Fluorouracil	51-21-8	500/10,000	500		313		
2,4-Dinitrophenol	51-28-5			10	313	P048	
Epinephrine	51-43-4			1,000		P042	
2-Chloro-N-(2-chloroethyl)-N-methylethanamine	51-75-2	10	10		X		
Mechlorethamine	51-75-2	10	10		X		
Nitrogen mustard	51-75-2	10	10		313		
Carbamic acid, ethyl ester	51-79-6			100	X	U238	
Ethyl carbamate	51-79-6			100	X	U238	
Urethane	51-79-6			100	313	U238	
Carbachol chloride	51-83-2	500/10,000	500				
Phosphonic acid, (2,2,2-trichloro-1-hydroxyethyl)-,dimethyl ester	52-68-6			100	X		
Trichlorfon	52-68-6			100	313		
Famphur	52-85-7			1,000	313	P097	
Dibenz[a,h]anthracene	53-70-3			1	313+^	U063	

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
2-Acetylaminofluorene	53-96-3			1	313	U005	
Nicotine	54-11-5	100	100	100	313c	P075	
Nicotine and salts	54-11-5			100	313c	P075	
Pyridine, 3-(1-methyl-2-pyrrolidinyl)-,(S)-	54-11-5	100	100	100		P075	
Aminopterin	54-62-6	500/10,000	500				
N-Nitrosodiethylamine	55-18-5			1	313	U174	
Benzamide	55-21-0				313		
Fenthion	55-38-9				313		
O,O-Dimethyl O-(3-methyl-4-(methylthio) phenyl) ester, phosphorothioic acid	55-38-9				X		
Nitroglycerin	55-63-0			10	313	P081	
Diisopropylfluorophosphate	55-91-4	100	100	100		P043	
Isofluorphate	55-91-4	100	100	100		P043	
Methylthiouracil	56-04-2			10		U164	
Carbon tetrachloride	56-23-5			10	313	U211	
Cantharidin	56-25-7	100/10,000	100				
Bis(tributyltin) oxide	56-35-9				313		
Parathion	56-38-2	100	10	10	313	P089	
Phosphorothioic acid, O,O-diethyl-O-(4-nitrophenyl) ester	56-38-2	100	10	10	X	P089	
3-Methylcholanthrene	56-49-5			10	313+^	U157	
Diethylstilbestrol	56-53-1			1		U089	
Benz[a]anthracene	56-55-3			10	313+^	U018	
Coumaphos	56-72-4	100/10,000	10	10			
Cyanides (soluble salts and complexes)	57-12-5			10	313c	P030	
1,1-Dimethyl hydrazine	57-14-7	1,000	10	10	313	U098	15,000
Dimethylhydrazine	57-14-7	1,000	10	10	X	U098	15,000
Hydrazine, 1,1-dimethyl-	57-14-7	1,000	10	10	X	U098	15,000
Strychnine	57-24-9	100/10,000	10	10	313c	P108	
Strychnine, and salts	57-24-9			10	313c	P108	
Pentobarbital sodium	57-33-0				313		
Phenytoin	57-41-0				313		
Physostigmine	57-47-6	100/10,000	1*	1*		P204	
beta-Propiolactone	57-57-8	500	10	10	313		
Physostigmine, salicylate (1:1)	57-64-7	100/10,000	1*	1*		P188	
4,7-Methanoindan, 1,2,3,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-	57-74-9	1,000	1	1	X	U036	
Chlordane	57-74-9	1,000	1	1	313^	U036	
7,12-Dimethylbenz[a]anthracene	57-97-6			1	313+^	U094	
Phenoxarsine, 10,10'-oxydi-	58-36-6	500/10,000	500				
Cyclohexane, 1,2,3,4,5,6-hexachloro-,(1.alpha.,2.alpha.,3.beta.,4.alpha.,5.alpha.,6.beta.)-	58-89-9	1,000/10,000	1	1	X	U129	
Hexachlorocyclohexane (gamma isomer)	58-89-9	1,000/10,000	1	1	X	U129	
Lindane	58-89-9	1,000/10,000	1	1	313	U129	
2,3,4,6-Tetrachlorophenol	58-90-2			10	313c		
p-Chloro-m-cresol	59-50-7			5,000		U039	
Phenylhydrazine hydrochloride	59-88-1	1,000/10,000	1,000				
N-Nitrosomorpholine	59-89-2			1	313		
Ethylenediamine-tetraacetic acid (EDTA)	60-00-4			5,000			
4-Aminoazobenzene	60-09-3				313		
4-Dimethylaminoazobenzene	60-11-7			10	313	U093	
Dimethylaminoazobenzene	60-11-7			10	X	U093	

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Ethane, 1,1'-oxybis-	60-29-7			100		U117	10,000
Ethyl ether	60-29-7			100		U117	10,000
Hydrazine, methyl-	60-34-4	500	10	10	X	P068	15,000
Methyl hydrazine	60-34-4	500	10	10	313	P068	15,000
Acetamide	60-35-5			100	313		
Strychnine, sulfate	60-41-3	100/10,000	10	10	313c		
Dimethoate	60-51-5	500/10,000	10	10	313	P044	
Dieldrin	60-57-1			1		P037	
Amitrole	61-82-5			10	313	U011	
Phenylmercuric acetate	62-38-4	500/10,000	100	100	313c	P092	
Phenylmercury acetate	62-38-4	500/10,000	100	100	313c	P092	
Phenacetin	62-44-2			100		U187	
Ethyl methanesulfonate	62-50-0			1		U119	
Aniline	62-53-3	1,000	5,000	5,000	313	U012	
Thioacetamide	62-55-5			10	313	U218	
Thiourea	62-56-6			10	313	U219	
Dichlorvos	62-73-7	1,000	10	10	313		
Phosphoric acid, 2-dichloroethenyl dimethyl ester	62-73-7	1,000	10	10	X		
Fluoroacetic acid, sodium salt	62-74-8	10/10,000	10	10	X	P058	
Sodium fluoroacetate	62-74-8	10/10,000	10	10	313	P058	
Methanamine, N-methyl-N-nitroso-	62-75-9	1,000	10	10	X	P082	
Nitrosodimethylamine	62-75-9	1,000	10	10	X	P082	
N-Nitrosodimethylamine	62-75-9	1,000	10	10	313	P082	
1-Naphthalenol, methylcarbamate	63-25-2			100	X	U279	
Carbaryl	63-25-2			100	313	U279	
Phenol, 3-(1-methylethyl)-, methylcarbamate	64-00-6	500/10,000	1*	1*		P202	
Formic acid	64-18-6			5,000	313	U123	
Acetic acid	64-19-7			5,000			
Diethyl sulfate	64-67-5			10	313		
Tetracycline hydrochloride	64-75-5				313		
Colchicine	64-86-8	10/10,000	10				
Nicotine sulfate	65-30-5	100/10,000	100	100	313c		
Benzoic acid	65-85-0			5,000			
Uracil mustard	66-75-1			10		U237	
Cycloheximide	66-81-9	100/10,000	100				
Methanol	67-56-1			5,000	313	U154	
Isopropyl alcohol (mfg-strong acid process)	67-63-0				313		
Acetone	67-64-1			5,000		U002	
Chloroform	67-66-3	10,000	10	10	313	U044	20,000
Methane, trichloro-	67-66-3	10,000	10	10	X	U044	20,000
Hexachloroethane	67-72-1			100	313	U131	
Dimethylformamide	68-12-2			100	X		
N,N-Dimethylformamide	68-12-2			100	313		
2,5-Cyclohexadiene-1,4-dione, 2,3,5-tris(1-aziridinyl)-	68-76-8				X		
Triaziquone	68-76-8				313		
Guanidine, N-methyl-N'-nitro-N-nitroso-	70-25-7			10		U163	
Hexachlorophene	70-30-4			100	313	U132	
Propiophenone, 4'-amino	70-69-9	100/10,000	100				
n-Butyl alcohol	71-36-3			5,000	313	U031	

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Benzene	71-43-2			10	313	U019	
1,1,1-Trichloroethane	71-55-6			1,000	313	U226	
Methyl chloroform	71-55-6			1,000	X	U226	
Digitoxin	71-63-6	100/10,000	100				
Endrin	72-20-8	500/10,000	1	1		P051	
Benzene, 1,1'-(2,2,2-trichloroethylidene)bis [4-methoxy-	72-43-5			1	X	U247	
Methoxychlor	72-43-5			1	313^	U247	
DDD	72-54-8			1		U060	
DDE	72-55-9			1			
Trypan blue	72-57-1			10	313	U236	
Methane	74-82-8						10,000
Bromomethane	74-83-9	1,000	1,000	1,000	313	U029	
Methyl bromide	74-83-9	1,000	1,000	1,000	X	U029	
Ethane	74-84-0						10,000
Ethene	74-85-1				X		10,000
Ethylene	74-85-1				313		10,000
Acetylene	74-86-2						10,000
Ethyne	74-86-2						10,000
Chloromethane	74-87-3			100	313	U045	10,000
Methane, chloro-	74-87-3			100	X	U045	10,000
Methyl chloride	74-87-3			100	X	U045	10,000
Methyl iodide	74-88-4			100	313	U138	
Methanamine	74-89-5			100			10,000
Monomethylamine	74-89-5			100			10,000
Hydrocyanic acid	74-90-8	100	10	10	X	P063	2,500
Hydrogen cyanide	74-90-8	100	10	10	313	P063	2,500
Methanethiol	74-93-1	500	100	100	X	U153	10,000
Methyl mercaptan	74-93-1	500	100	100	313s	U153	10,000
Thiomethanol	74-93-1	500	100	100	X	U153	10,000
Methylene bromide	74-95-3			1,000	313	U068	
Propane	74-98-6						10,000
1-Propyne	74-99-7						10,000
Propyne	74-99-7						10,000
Chloroethane	75-00-3			100	313		10,000
Ethane, chloro-	75-00-3			100	X		10,000
Ethyl chloride	75-00-3			100	X		10,000
Ethene, chloro-	75-01-4			1	X	U043	10,000
Vinyl chloride	75-01-4			1	313	U043	10,000
Ethene, fluoro-	75-02-5						10,000
Vinyl fluoride	75-02-5						10,000
Ethanamine	75-04-7			100			10,000
Monoethylamine	75-04-7			100			10,000
Acetonitrile	75-05-8			5,000	313	U003	
Acetaldehyde	75-07-0			1,000	313	U001	10,000
Ethanethiol	75-08-1						10,000
Ethyl mercaptan	75-08-1						10,000
Dichloromethane	75-09-2			1,000	313	U080	
Methylene chloride	75-09-2			1,000	X	U080	
Carbon disulfide	75-15-0	10,000	100	100	313	P022	20,000
Cyclopropane	75-19-4						10,000
Calcium carbide	75-20-7			10			

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Ethylene oxide	75-21-8	1,000	10	10	313	U115	10,000
Oxirane	75-21-8	1,000	10	10	X	U115	10,000
Bromoform	75-25-2			100	313	U225	
Tribromomethane	75-25-2			100	X	U225	
Dichlorobromomethane	75-27-4			5,000	313		
Isobutane	75-28-5						10,000
Propane, 2-methyl	75-28-5						10,000
Isopropyl chloride	75-29-6						10,000
Propane, 2-chloro-	75-29-6						10,000
2-Propanamine	75-31-0						10,000
Isopropylamine	75-31-0						10,000
1,1-Dichloroethane	75-34-3			1,000	X	U076	
Ethylidene Dichloride	75-34-3			1,000	313	U076	
1,1-Dichloroethylene	75-35-4			100	X	U078	10,000
Ethene, 1,1-dichloro-	75-35-4			100	X	U078	10,000
Vinylidene chloride	75-35-4			100	313	U078	10,000
Acetyl chloride	75-36-5			5,000		U006	
Difluoroethane	75-37-6						10,000
Ethane, 1,1-difluoro-	75-37-6						10,000
Ethene, 1,1-difluoro-	75-38-7						10,000
Vinylidene fluoride	75-38-7						10,000
Dichlorofluoromethane	75-43-4				313		
HCFC-21	75-43-4				X		
Carbonic dichloride	75-44-5	10	10	10	X	P095	500
Phosgene	75-44-5	10	10	10	313	P095	500
Chlorodifluoromethane	75-45-6				313		
HCFC-22	75-45-6				X		
Methanamine, N,N-dimethyl-	75-50-3			100			10,000
Trimethylamine	75-50-3			100			10,000
Aziridine, 2-methyl	75-55-8	10,000	1	1	X	P067	10,000
Propyleneimine	75-55-8	10,000	1	1	313	P067	10,000
Oxirane, methyl-	75-56-9	10,000	100	100	X		10,000
Propylene oxide	75-56-9	10,000	100	100	313		10,000
Cacodylic acid	75-60-5			1		U136	
Bromotrifluoromethane	75-63-8				313		
Halon 1301	75-63-8				X		
tert-Butylamine	75-64-9			1,000			
tert-Butyl alcohol	75-65-0				313		
1-Chloro-1,1-difluoroethane	75-68-3				313		
HCFC-142b	75-68-3				X		
CFC-11	75-69-4			5,000	X	U121	
Trichlorofluoromethane	75-69-4			5,000	313	U121	
Trichloromonofluoromethane	75-69-4			5,000	X	U121	
CFC-12	75-71-8			5,000	X	U075	
Dichlorodifluoromethane	75-71-8			5,000	313	U075	
CFC-13	75-72-9				X		
Chlorotrifluoromethane	75-72-9				313		
Plumbane, tetramethyl-	75-74-1	100	100				10,000
Tetramethyllead	75-74-1	100	100		313c		10,000
Silane, tetramethyl-	75-76-3						10,000
Tetramethylsilane	75-76-3						10,000
Silane, chlorotrimethyl-	75-77-4	1,000	1,000				10,000

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Trimethylchlorosilane	75-77-4	1,000	1,000				10,000
Dimethyldichlorosilane	75-78-5	500	500				5,000
Silane, dichlorodimethyl-	75-78-5	500	500				5,000
Methyltrichlorosilane	75-79-6	500	500				5,000
Silane, trichloromethyl-	75-79-6	500	500				5,000
2-Methyllactonitrile	75-86-5	1,000	10	10	313	P069	
Acetone cyanohydrin	75-86-5	1,000	10	10	X	P069	
Acetaldehyde, trichloro-	75-87-6			5,000		U034	
2-Chloro-1,1,1-trifluoroethane	75-88-7				313		
HCFC-133a	75-88-7				X		
2,2-Dichloropropionic acid	75-99-0			5,000			
Pentachloroethane	76-01-7			10	313	U184	
Trichloroacetyl chloride	76-02-8	500	500		313		
Chloropicrin	76-06-2				313		
Ethane, 1,1,2-trichloro-1,2,2,-trifluoro-	76-13-1				X		
Freon 113	76-13-1				313		
CFC-114	76-14-2				X		
Dichlorotetrafluoroethane	76-14-2				313		
CFC-115	76-15-3				X		
Monochloropentafluoroethane	76-15-3				313		
1,4,5,6,7,8,8-Heptachloro-3a,4,7,7a-tetrahydro-4,7-methano-1H-indene	76-44-8			1	X	P059	
Heptachlor	76-44-8			1	313^	P059	
Triphenyltin hydroxide	76-87-9				313		
Hexachlorocyclopentadiene	77-47-4	100	10	10	313	U130	
Dicyclopentadiene	77-73-6				313		
Dimethyl sulfate	77-78-1	500	100	100	313	U103	
Tabun	77-81-6	10	10				
Tetraethyl lead	78-00-2	100	10	10	313c	P110	
Dioxathion	78-34-2	500	500				
DEF	78-48-8				X		
S,S,S-Tributyltrithiophosphate	78-48-8				313		
Amiton	78-53-5	500	500				
Isophorone	78-59-1			5,000			
Oxetane, 3,3-bis(chloromethyl)-	78-71-7	500	500				
Butane, 2-methyl-	78-78-4						10,000
Isopentane	78-78-4						10,000
1,3-Butadiene, 2-methyl-	78-79-5			100			10,000
Isoprene	78-79-5			100			10,000
iso-Butylamine	78-81-9			1,000			
Isobutyronitrile	78-82-0	1,000	1,000				20,000
Propanenitrile, 2-methyl-	78-82-0	1,000	1,000				20,000
Isobutyl alcohol	78-83-1			5,000		U140	
Isobutyraldehyde	78-84-2				313		
1,2-Dichloropropane	78-87-5			1,000	313	U083	
Propane 1,2-dichloro-	78-87-5			1,000	X	U083	
2,3-Dichloropropene	78-88-6			100	313		
sec-Butyl alcohol	78-92-2				313		
Methyl ethyl ketone	78-93-3			5,000	313	U159	
Methyl ethyl ketone (MEK)	78-93-3			5,000	X	U159	
Methyl vinyl ketone	78-94-4	10	10				
Lactonitrile	78-97-7	1,000	1,000				

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
1,1-Dichloropropane	78-99-9			1,000			
1,1,2-Trichloroethane	79-00-5			100	313	U227	
Trichloroethylene	79-01-6			100	313	U228	
Acrylamide	79-06-1	1,000/10,000	5,000	5,000	313	U007	
Propionic acid	79-09-4			5,000			
Acrylic acid	79-10-7			5,000	313	U008	
Chloroacetic acid	79-11-8	100/10,000	100	100	313		
Thiosemicarbazide	79-19-6	100/10,000	100	100	313	P116	
Ethaneperoxoic acid	79-21-0	500	500		X		10,000
Peracetic acid	79-21-0	500	500		313		10,000
Carbonochloridic acid, methylester	79-22-1	500	1,000	1,000	X	U156	5,000
Methyl chlorocarbonate	79-22-1	500	1,000	1,000	313	U156	5,000
Methyl chloroformate	79-22-1	500	1,000	1,000	X	U156	5,000
iso-Butyric acid	79-31-2			5,000			
1,1,2,2-Tetrachloroethane	79-34-5			100	313	U209	
Ethene, chlorotrifluoro-	79-38-9						10,000
Trifluorochloroethylene	79-38-9						10,000
Dimethylcarbamyl chloride	79-44-7			1	313	U097	
2-Nitropropane	79-46-9			10	313	U171	
Tetrabromobisphenol A	79-94-7				313^		
4,4'-Isopropylidenediphenol	80-05-7				313		
Cumene hydroperoxide	80-15-9			10	313	U096	
Hydroperoxide, 1-methyl-1-phenylethyl-	80-15-9			10	X	U096	
Methyl methacrylate	80-62-6			1,000	313	U162	
Methyl 2-chloroacrylate	80-63-7	500	500				
Saccharin (manufacturing)	81-07-2			100	313	U202	
Saccharin and salts	81-07-2			100		U202	
Warfarin	81-81-2	500/10,000	100	100	X 313c	P001	
Warfarin, & salts, conc.>0.3%	81-81-2			100	X 313c	P001	
C.I. Food Red 15	81-88-9				313		
1-Amino-2-methylanthraquinone	82-28-0				313		
Diphacinone	82-66-6	10/10,000	10				
PCNB	82-68-8			100	X	U185	
Pentachloronitrobenzene	82-68-8			100	X	U185	
Quintozene	82-68-8			100	313	U185	
Acenaphthene	83-32-9			100			
Diethyl phthalate	84-66-2			1,000		U088	
Dibutyl phthalate	84-74-2			10	313	U069	
n-Butyl phthalate	84-74-2			10	X	U069	
Diquat	85-00-7			1,000			
Phenanthrene	85-01-8			5,000	313		
Phthalic anhydride	85-44-9			5,000	313	U190	
Butyl benzyl phthalate	85-68-7			100			
N-Nitrosodiphenylamine	86-30-6			100	313		
Azinphos-methyl	86-50-0	10/10,000	1	1			
Guthion	86-50-0	10/10,000	1	1			
Fluorene	86-73-7			5,000			
ANTU	86-88-4	500/10,000	100	100		P072	
Thiourea, 1-naphthalenyl-	86-88-4	500/10,000	100	100		P072	
2,6-Xylidine	87-62-7				313		
2,6-Dichlorophenol	87-65-0			100		U082	
Hexachloro-1,3-butadiene	87-68-3			1	313	U128	

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Hexachlorobutadiene	87-68-3			1	X	U128	
PCP	87-86-5			10	X		
Pentachlorophenol	87-86-5			10	313		
Aniline, 2,4,6-trimethyl-	88-05-1	500	500				
2,4,6-Trichlorophenol	88-06-2			10	313		
o-Nitrotoluene	88-72-2			1,000			
2-Nitrophenol	88-75-5			100	313		
Dinitrobutyl phenol	88-85-7	100/10,000	1,000	1,000	313	P020	
Dinoseb	88-85-7	100/10,000	1,000	1,000	X	P020	
Picric acid	88-89-1				313		
o-Anisidine	90-04-0			100	313		
2-Phenylphenol	90-43-7				313		
Michler's ketone	90-94-8				313		
Benzene, 1,3-diisocyanato-2-methyl-	91-08-7	100	100	100	X		10,000
Toluene-2,6-diisocyanate	91-08-7	100	100	100	313		10,000
Naphthalene	91-20-3			100	313	U165	
Quinoline	91-22-5			5,000	313		
2-Chloronaphthalene	91-58-7			5,000		U047	
beta-Naphthylamine	91-59-8			10	313	U168	
N,N-Diethylaniline	91-66-7			1,000			
Methapyrilene	91-80-5			5,000		U155	
3,3'-Dimethoxybenzidine-4,4'-diisocyanate	91-93-0				313#		
3,3'-Dichlorobenzidine	91-94-1			1	313	U073	
3,3'-Dimethyl-4,4'-diphenylene diisocyanate	91-97-4				313#		
Biphenyl	92-52-4			100	313		
4-Aminobiphenyl	92-67-1			1	313		
Benzidine	92-87-5			1	313	U021	
4-Nitrobiphenyl	92-93-3			10	313		
Mecoprop	93-65-2				313		
Silvex (2,4,5-TP)	93-72-1			100			
2,4,5-T acid	93-76-5			1,000			
2,4,5-T esters	93-79-8			1,000			
2,4-D Esters	94-11-1			100	X		
2,4-D isopropyl ester	94-11-1			100	313		
Benzoyl peroxide	94-36-0				313		
Dihydrosafrole	94-58-6			10	313	U090	
Safrole	94-59-7			100	313	U203	
(4-Chloro-2-methylphenoxy) acetic acid	94-74-6				X		
MCPA	94-74-6				X		
Methoxone	94-74-6				313		
2,4-D	94-75-7			100	313	U240	
2,4-D Acid	94-75-7			100	X	U240	
2,4-D, salts and esters	94-75-7			100		U240	
Acetic acid, (2,4-dichlorophenoxy)-	94-75-7			100	X	U240	
2,4-D Esters	94-79-1			100			
2,4-D butyl ester	94-80-4			100	313		
2,4-D Esters	94-80-4			100	X		
2,4-DB	94-82-6				313		
Benzene, o-dimethyl-	95-47-6			1,000	X	U239	
o-Xylene	95-47-6			1,000	313	U239	

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
o-Cresol	95-48-7	1,000/10,000	100	100	313	U052	
1,2-Dichlorobenzene	95-50-1			100	313	U070	
o-Dichlorobenzene	95-50-1			100	X	U070	
o-Toluidine	95-53-4			100	313	U328	
1,2-Phenylenediamine	95-54-5				313		
2-Chlorophenol	95-57-8			100		U048	
1,2,4-Trimethylbenzene	95-63-6				313		
p-Chloro-o-toluidine	95-69-2				313		
2,4-Diaminotoluene	95-80-7			10	313		
1,2,4,5-Tetrachlorobenzene	95-94-3			5,000		U207	
2,4,5-Trichlorophenol	95-95-4			10	313		
Styrene oxide	96-09-3			100	313		
1,2-Dibromo-3-chloropropane	96-12-8			1	313	U066	
DBCP	96-12-8			1	X	U066	
1,2,3-Trichloropropane	96-18-4				313		
Methyl acrylate	96-33-3				313		
Ethylene thiourea	96-45-7			10	313	U116	
2,2'-Methylenebis(4-chlorophenol	97-23-4				X		
Dichlorophene	97-23-4				313		
C.I. Solvent Yellow 3	97-56-3				313		
Ethyl methacrylate	97-63-2			1,000		U118	
Furfural	98-01-1			5,000		U125	
Benzenearsonic acid	98-05-5	10/10,000	10				
Benzoic trichloride	98-07-7	100	10	10	313	U023	
Benzotrichloride	98-07-7	100	10	10	X	U023	
Benzenesulfonyl chloride	98-09-9			100		U020	
Trichlorophenylsilane	98-13-5	500	500				
Benzenamine, 3-(trifluoromethyl)-	98-16-8	500	500				
Cumene	98-82-8			5,000	313	U055	
Acetophenone	98-86-2			5,000	313	U004	
Benzal chloride	98-87-3	500	5,000	5,000	313	U017	
Benzoyl chloride	98-88-4			1,000	313		
Nitrobenzene	98-95-3	10,000	1,000	1,000	313	U169	
m-Nitrotoluene	99-08-1			1,000			
2,6-Dichloro-4-nitroaniline	99-30-9				X		
Dichloran	99-30-9				313		
1,3,5-Trinitrobenzene	99-35-4			10		U234	
5-Nitro-o-toluidine	99-55-8			100	313	U181	
5-Nitro-o-anisidine	99-59-2				313		
m-Dinitrobenzene	99-65-0			100	313		
Dimethyl-p-phenylenediamine	99-98-9	10/10,000	10				
p-Nitrotoluene	99-99-0			1,000			
p-Nitroaniline	100-01-6			5,000	313	P077	
4-Nitrophenol	100-02-7			100	313	U170	
p-Nitrophenol	100-02-7			100	X	U170	
Benzene, 1-(chloromethyl)-4-nitro-	100-14-1	500/10,000	500				
p-Dinitrobenzene	100-25-4			100	313		
Ethylbenzene	100-41-4			1,000	313		
Styrene	100-42-5			1,000	313		
Benzyl chloride	100-44-7	500	100	100	313	P028	
Benzonitrile	100-47-0			5,000			
N-Nitrosopiperidine	100-75-4			10	313	U179	

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
4,6-Dichloro-N-(2-chlorophenyl)-1,3,5-triazin-2-amine	101-05-3				X		
Anilazine	101-05-3				313		
4,4'-Methylenebis(2-chloroaniline)	101-14-4			10	313	U158	
MBOCA	101-14-4			10	X	U158	
Barban	101-27-9			1*		U280	
4-Bromophenyl phenyl ether	101-55-3			100		U030	
4,4'-Methylenebis(N,N-dimethyl)benzenamine	101-61-1				313		
MDI	101-68-8			5,000	X		
Methylenebis(phenylisocyanate)	101-68-8			5,000	313#		
4,4'-Methylenedianiline	101-77-9			10	313		
4,4'-Diaminodiphenyl ether	101-80-4				313		
Diglycidyl resorcinol ether	101-90-6				313		
Isocyanic acid, 3,4-dichlorophenyl ester	102-36-3	500/10,000	500				
Phenylthiourea	103-85-5	100/10,000	100	100		P093	
p-Chlorophenyl isocyanate	104-12-1				313		
1,4-Phenylene diisocyanate	104-49-4				313#		
p-Anisidine	104-94-9				313		
sec-Butyl acetate	105-46-4			5,000			
2,4-Dimethylphenol	105-67-9			100	313	U101	
Benzene, p-dimethyl-	106-42-3			100	X	U239	
p-Xylene	106-42-3			100	313	U239	
p-Cresol	106-44-5			100	313	U052	
1,4-Dichlorobenzene	106-46-7			100	313	U072	
p-Chloroaniline	106-47-8			1,000	313	P024	
p-Toluidine	106-49-0			100		U353	
p-Phenylenediamine	106-50-3			5,000	313		
p-Benzoquinone	106-51-4			10	X	U197	
Quinone	106-51-4			10	313	U197	
1,2-Butylene oxide	106-88-7			100	313		
Epichlorohydrin	106-89-8	1,000	100	100	313	U041	20,000
Oxirane, (chloromethyl)-	106-89-8	1,000	100	100	X	U041	20,000
1,2-Dibromoethane	106-93-4			1	313	U067	
Ethylene dibromide	106-93-4			1	X	U067	
Propargyl bromide	106-96-7	10	10				
Butane	106-97-8						10,000
1-Butene	106-98-9						10,000
1,3-Butadiene	106-99-0			10	313		10,000
1-Butyne	107-00-6						10,000
Ethyl acetylene	107-00-6						10,000
2-Butene	107-01-7						10,000
2-Propenal	107-02-8	500	1	1	X	P003	5,000
Acrolein	107-02-8	500	1	1	313	P003	5,000
Allyl chloride	107-05-1			1,000	313		
1,2-Dichloroethane	107-06-2			100	313	U077	
Ethylene dichloride	107-06-2			100	X	U077	
Chloroethanol	107-07-3	500	500				
n-Propylamine	107-10-8			5,000		U194	
2-Propen-1-amine	107-11-9	500	500		X		10,000
Allylamine	107-11-9	500	500		313		10,000
Ethyl cyanide	107-12-0	500	10	10		P101	10,000

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Propanenitrile	107-12-0	500	10	10		P101	10,000
Propionitrile	107-12-0	500	10	10		P101	10,000
2-Propenenitrile	107-13-1	10,000	100	100	X	U009	20,000
Acrylonitrile	107-13-1	10,000	100	100	313	U009	20,000
1,2-Ethanediamine	107-15-3	10,000	5,000	5,000			20,000
Ethylenediamine	107-15-3	10,000	5,000	5,000			20,000
Formaldehyde cyanohydrin	107-16-4	1,000	1,000				
2-Propen-1-ol	107-18-6	1,000	100	100	X	P005	15,000
Allyl alcohol	107-18-6	1,000	100	100	313	P005	15,000
Propargyl alcohol	107-19-7			1,000	313	P102	
Chloroacetaldehyde	107-20-0			1,000		P023	
Ethylene glycol	107-21-1			5,000	313		
Ethene, methoxy-	107-25-5						10,000
Vinyl methyl ether	107-25-5						10,000
Chloromethyl methyl ether	107-30-2	100	10	10	313	U046	5,000
Methane, chloromethoxy-	107-30-2	100	10	10	X	U046	5,000
Formic acid, methyl ester	107-31-3						10,000
Methyl formate	107-31-3						10,000
Sarin	107-44-8	10	10				
TEPP	107-49-3	100	10	10		P111	
Tetraethyl pyrophosphate	107-49-3	100	10	10		P111	
Butyric acid	107-92-6			5,000			
Acetic acid ethenyl ester	108-05-4	1,000	5,000	5,000	X		15,000
Vinyl acetate	108-05-4	1,000	5,000	5,000	313		15,000
Vinyl acetate monomer	108-05-4	1,000	5,000	5,000	X		15,000
Methyl isobutyl ketone	108-10-1			5,000	313	U161	
Carbonochloridic acid, 1-methylethyl ester	108-23-6	1,000	1,000				15,000
Isopropyl chloroformate	108-23-6	1,000	1,000				15,000
Acetic anhydride	108-24-7			5,000			
Maleic anhydride	108-31-6			5,000	313	U147	
Benzene, m-dimethyl-	108-38-3			1,000	X	U239	
m-Xylene	108-38-3			1,000	313	U239	
m-Cresol	108-39-4			100	313	U052	
1,3-Phenylenediamine	108-45-2				313		
Resorcinol	108-46-3			5,000		U201	
Bis(2-chloro-1-methylethyl)ether	108-60-1			1,000	313	U027	
Dichloroisopropyl ether	108-60-1			1,000	X	U027	
Toluene	108-88-3			1,000	313	U220	
Chlorobenzene	108-90-7			100	313	U037	
Cyclohexanamine	108-91-8	10,000	10,000				15,000
Cyclohexylamine	108-91-8	10,000	10,000				15,000
Cyclohexanol	108-93-0				313		
Cyclohexanone	108-94-1			5,000		U057	
Phenol	108-95-2	500/10,000	1,000	1,000	313	U188	
Benzenethiol	108-98-5	500	100	100		P014	
Thiophenol	108-98-5	500	100	100		P014	
2-Methylpyridine	109-06-8			5,000	313	U191	
2-Picoline	109-06-8			5,000	X	U191	
Carbonochloridic acid, propylester	109-61-5	500	500				15,000
Propyl chloroformate	109-61-5	500	500				15,000
Pentane	109-66-0						10,000

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1-Pentene	109-67-1						10,000
Butylamine	109-73-9			1,000			
Malononitrile	109-77-3	500/10,000	1,000	1,000	313	U149	
2-Methoxyethanol	109-86-4				313		
Diethylamine	109-89-7			100			
Ethene, ethoxy-	109-92-2						10,000
Vinyl ethyl ether	109-92-2						10,000
Ethyl nitrite	109-95-5						10,000
Nitrous acid, ethyl ester	109-95-5						10,000
Furan, tetrahydro-	109-99-9			1,000		U213	
Furan	110-00-9	500	100	100		U124	5,000
Maleic acid	110-16-7			5,000			
Fumaric acid	110-17-8			5,000			
iso-Butyl acetate	110-19-0			5,000			
Hexane	110-54-3			5,000	X		
n-Hexane	110-54-3			5,000	313		
trans-1,4-Dichloro-2-butene	110-57-6	500	500		313		
trans-1,4-Dichlorobutene	110-57-6	500	500		X		
2-Chloroethyl vinyl ether	110-75-8			1,000		U042	
2-Ethoxyethanol	110-80-5			1,000	313	U359	
Ethanol, 2-ethoxy-	110-80-5			1,000	X	U359	
Cyclohexane	110-82-7			1,000	313	U056	
Pyridine	110-86-1			1,000	313	U196	
Piperidine	110-89-4	1,000	1,000				15,000
Diethanolamine	111-42-2			100	313		
Bis(2-chloroethyl) ether	111-44-4	10,000	10	10	313	U025	
Dichloroethyl ether	111-44-4	10,000	10	10	X	U025	
Ethylenebisdithiocarbamic acid, salts & esters	111-54-6			5,000	X	U114	
Adiponitrile	111-69-3	1,000	1,000				
Bis(2-chloroethoxy) methane	111-91-1			1,000	313	U024	
Phenol, 2-(1-methylethoxy)-, methylcarbamate	114-26-1			100	X	U411	
Propoxur	114-26-1			100	313	U411	
Azaserine	115-02-6			1		U015	
1-Propene	115-07-1				X		10,000
Propene	115-07-1				X		10,000
Propylene	115-07-1				313		10,000
Methane, oxybis-	115-10-6						10,000
Methyl ether	115-10-6						10,000
1-Propene, 2-methyl-	115-11-7						10,000
2-Methylpropene	115-11-7						10,000
Trichloroethylsilane	115-21-9	500	500				
Dimefox	115-26-4	500	500				
Chlorendic acid	115-28-6				313		
Endosulfan	115-29-7	10/10,000	1	1		P050	
Benzenemethanol, 4-chloro-.alpha.-4-chlorophenyl)-.alpha.-(trichloromethyl)-	115-32-2			10	X		
Dicofol	115-32-2			10	313		
Fensulfothion	115-90-2	500	500				
Aldicarb	116-06-3	100/10,000	1	1	313	P070	
Ethene, tetrafluoro-	116-14-3						10,000

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Tetrafluoroethylene	116-14-3						10,000
2-Aminoanthraquinone	117-79-3				313		
Dichlone	117-80-6			1			
Bis(2-ethylhexyl)phthalate	117-81-7			100	X	U028	
DEHP	117-81-7			100	X	U028	
Di(2-ethylhexyl) phthalate	117-81-7			100	313	U028	
Di-n-octyl phthalate	117-84-0			5,000		U107	
n-Dioctylphthalate	117-84-0			5,000		U107	
Hexachlorobenzene	118-74-1			10	313^	U127	
Isopropylmethylpyrazolyl dimethylcarbamate	119-38-0	500	1*	1*		P192	
3,3'-Dimethoxybenzidine	119-90-4			100	313	U091	
3,3'-Dimethylbenzidine	119-93-7			10	313	U095	
o-Tolidine	119-93-7			10	X	U095	
Anthracene	120-12-7			5,000	313		
2,4-DP	120-36-5				313		
Isosafrole	120-58-1			100	313	U141	
p-Cresidine	120-71-8				313		
Catechol	120-80-9			100	313		
1,2,4-Trichlorobenzene	120-82-1			100	313		
2,4-Dichlorophenol	120-83-2			100	313	U081	
2,4-Dinitrotoluene	121-14-2			10	313	U105	
Pyrethrins	121-21-1			1			
Pyrethrins	121-29-9			1			
Triethylamine	121-44-8			5,000	313	U404	
N,N-Dimethylaniline	121-69-7			100	313		
Malathion	121-75-5			100	313		
Benzeneethanamine, alpha,alpha-dimethyl-	122-09-8			5,000		P046	
Simazine	122-34-9				313		
Diphenylamine	122-39-4				313		
Propham	122-42-9			1*		U373	
1,2-Diphenylhydrazine	122-66-7			10	313	U109	
Hydrazine, 1,2-diphenyl-	122-66-7			10	X	U109	
Hydrazobenzene	122-66-7			10	X	U109	
Hydroquinone	123-31-9	500/10,000	100	100	313		
Maleic hydrazide	123-33-1			5,000		U148	
Propionaldehyde	123-38-6			1,000	313		
1,3-Phenylene diisocyanate	123-61-5				313#		
Propionic anhydride	123-62-6			5,000			
Paraldehyde	123-63-7			1,000	313	U182	
Butyraldehyde	123-72-8				313		
2-Butenal, (e)-	123-73-9	1,000	100	100		U053	20,000
Crotonaldehyde, (E)-	123-73-9	1,000	100	100		U053	20,000
Butyl acetate	123-86-4			5,000			
1,4-Dioxane	123-91-1			100	313	U108	
iso-Amyl acetate	123-92-2			5,000			
Adipic acid	124-04-9			5,000			
Dimethylamine	124-40-3			1,000	313	U092	10,000
Methanamine, N-methyl-	124-40-3			1,000	X	U092	10,000
Sodium methylate	124-41-4			1,000			
Chlorodibromomethane	124-48-1			100			

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Sodium cacodylate	124-65-2	100/10,000	100				
Dibromotetrafluoroethane	124-73-2				313		
Halon 2402	124-73-2				X		
Picrotoxin	124-87-8	500/10,000	500				
Tris(2,3-dibromopropyl) phosphate	126-72-7			10	313	U235	
2-Propenenitrile, 2-methyl-	126-98-7	500	1,000	1,000	X	U152	10,000
Methacrylonitrile	126-98-7	500	1,000	1,000	313	U152	10,000
Chloroprene	126-99-8			100	313		
Perchloroethylene	127-18-4			100	X	U210	
Tetrachloroethylene	127-18-4			100	313	U210	
Zinc phenolsulfonate	127-82-2			5,000	313c		
Potassium dimethyldithiocarbamate	128-03-0				313		
Sodium dimethyldithiocarbamate	128-04-1				313		
C.I. Vat Yellow 4	128-66-5				313		
Pyrene	129-00-0	1,000/10,000	5,000	5,000			
Warfarin sodium	129-06-6	100/10,000	100	100	313c		
1,4-Naphthoquinone	130-15-4			5,000		U166	
Dimethyl phthalate	131-11-3			5,000	313	U102	
Sodium pentachlorophenate	131-52-2				313		
Ammonium picrate	131-74-8			10		P009	
2-Cyclohexyl-4,6-dinitrophenol	131-89-5			100		P034	
Sodium o-phenylphenoxide	132-27-4				313		
Dibenzofuran	132-64-9			100	313		
1H-Isoindole-1,3(2H)-dione, 3a,4,7,7a-tetrahydro-2-[(trichloromethyl)thio]-	133-06-2			10	X		
Captan	133-06-2			10	313		
Folpet	133-07-3				313		
Benzoic acid, 3-amino-2,5-dichloro-	133-90-4			100	X		
Chloramben	133-90-4			100	313		
o-Anisidine hydrochloride	134-29-2				313		
alpha-Naphthylamine	134-32-7			100	313	U167	
Benzeneamine, N-hydroxy-N-nitroso, ammonium salt	135-20-6				X		
Cupferron	135-20-6				313		
Dipropyl isocinchomeronate	136-45-8				313		
Thiram	137-26-8			10	313	U244	
Ziram	137-30-4			1*		P205	
Potassium N-methyldithiocarbamate	137-41-7				313		
Metham sodium	137-42-8				313		
Sodium methyldithiocarbamate	137-42-8				X		
Disodium cyanodithioimidocarbonate	138-93-2				313		
Nitrilotriacetic acid	139-13-9				313		
3,3'-Dimethyldiphenylmethane-4,4'-diisocyanate	139-25-3				313#		
4,4'-Thiodianiline	139-65-1				313		
Benzyl cyanide	140-29-4	500	500				
Pyridine, 2-methyl-5-vinyl-	140-76-1	500	500				
Ethyl acrylate	140-88-5			1,000	313	U113	
Butyl acrylate	141-32-2				313		
Dicrotophos	141-66-2	100	100				
Ethyl acetate	141-78-6			5,000		U112	
1,3-Dichloropropane	142-28-9			5,000			

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Nabam	142-59-6				313		
Cupric acetate	142-71-2			100	313c		
Dipropylamine	142-84-7			5,000		U110	
Sodium cyanide (Na(CN))	143-33-9	100	10	10	313c	P106	
Kepone	143-50-0			1		U142	
Fluoroacetic acid	144-49-0	10/10,000	10				
Endothall	145-73-3			1,000		P088	
2-(4-Thiazolyl)-1H-benzimidazole	148-79-8				X		
Thiabendazole	148-79-8				313		
Melphalan	148-82-3			1		U150	
2-Mercaptobenzothiazole	149-30-4				313		
MBT	149-30-4				X		
Dichloromethylphenylsilane	149-74-6	1,000	1,000				
Merphos	150-50-5				313		
Monuron	150-68-5				313		
Methoxyethylmercuric acetate	151-38-2	500/10,000	500		313c		
Potassium cyanide	151-50-8	100	10	10	313c	P098	
Aziridine	151-56-4	500	1	1	X	P054	10,000
Ethyleneimine	151-56-4	500	1	1	313	P054	10,000
Diphosphoramide, octamethyl-	152-16-9	100	100	100		P085	
p-Nitrosodiphenylamine	156-10-5				313		
1,2-Dichloroethylene	156-60-5			1,000		U079	
Calcium cyanamide	156-62-7			1,000	313		
Benzo(rst)pentaphene	189-55-9			10	313+	U064	
Dibenz[a,i]pyrene	189-55-9			10	X	U064	
Dibenzo(a,h)pyrene	189-64-0				313+^		
Benzo[g,h,i]perylene	191-24-2			5,000	313^		
Dibenzo(a,l)pyrene	191-30-0				313+^		
Dibenzo(a,e)pyrene	192-65-4				313+^		
Indeno(1,2,3-cd)pyrene	193-39-5			100	313+^	U137	
7H-Dibenzo(c,g)carbazole	194-59-2				313+^		
Benzo(j)fluoranthene	205-82-3				313+^		
Benzo[b]fluoranthene	205-99-2			1	313+^		
Fluoranthene	206-44-0			100	X	U120	
Benzo(k)fluoranthene	207-08-9			5,000	313+^		
Acenaphthylene	208-96-8			5,000			
Benzo(a)phenanthrene	218-01-9			100	313+^	U050	
Chrysene	218-01-9			100	X	U050	
Dibenz(a,j)acridine	224-42-0				313+^		
Benz[c]acridine	225-51-4			100		U016	
Dibenz(a,h)acridine	226-36-8				313+^		
Isobenzan	297-78-9	100/10,000	100				
O,O-Diethyl O-pyrazinyl phosphorothioate	297-97-2	500	100	100		P040	
Thionazin	297-97-2	500	100	100		P040	
Methyl parathion	298-00-0	100/10,000	100	100	313	P071	
Parathion-methyl	298-00-0	100/10,000	100	100	X	P071	
Phorate	298-02-2	10	10	10		P094	
Disulfoton	298-04-4	500	1	1		P039	
Amphetamine	300-62-9	1,000	1,000				
Naled	300-76-5			10	313		
Lead acetate	301-04-2			10	313c	U144	

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Oxydemeton methyl	301-12-2				313		
S-(2-(Ethylsulfinyl)ethyl) O,O-dimethyl ester phosphorothioic acid	301-12-2				X		
Hydrazine	302-01-2	1,000	1	1	313	U133	15,000
Lasiocarpine	303-34-4			10		U143	
Chlorambucil	305-03-3			10		U035	
2,2-Dichloro-1,1,1-trifluoroethane	306-83-2				313		
HCFC-123	306-83-2				X		
1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-(1.alpha.,4.alpha.,4a.beta.,5.alpha.,8.alpha.,8a.beta.)-	309-00-2	500/10,000	1	1	X	P004	
Aldrin	309-00-2	500/10,000	1	1	313^	P004	
Diethyl-p-nitrophenyl phosphate	311-45-5			100		P041	
5-Bromo-6-methyl-3-(1-methylpropyl)-2,4-(1H,3H)-pyrimidinedione	314-40-9				X		
Bromacil	314-40-9				313		
Mexacarbate	315-18-4	500/10,000	1,000	1,000		P128	
Emetine, dihydrochloride	316-42-7	1/10,000	1				
alpha-BHC	319-84-6			10	X		
alpha-Hexachlorocyclohexane	319-84-6			10	313		
beta-BHC	319-85-7			1			
delta-BHC	319-86-8			1			
Trichloronate	327-98-0	500	500				
2,5-Dinitrophenol	329-71-5			10			
Diuron	330-54-1			100	313		
Linuron	330-55-2				313		
Diazinon	333-41-5			1	313		
Diazomethane	334-88-3			100	313		
Boron trifluoride compound with methyl ether (1:1)	353-42-4	1,000	1,000				15,000
Boron, trifluoro[oxybis[methane]]-, (T-4)-	353-42-4	1,000	1,000				15,000
Carbonic difluoride	353-50-4			1,000		U033	
Bromochlorodifluoromethane	353-59-3				313		
Halon 1211	353-59-3				X		
1,1,1,2-Tetrachloro-2-fluoroethane	354-11-0				313		
HCFC-121a	354-11-0				X		
1,1,2,2-Tetrachloro-1-fluoroethane	354-14-3				313		
HCFC-121	354-14-3				X		
1,2-Dichloro-1,1,2-trifluoroethane	354-23-4				313		
HCFC-123a	354-23-4				X		
1-Chloro-1,1,2,2-tetrafluoroethane	354-25-6				313		
HCFC-124a	354-25-6				X		
Brucine	357-57-3			100	313	P018	
Fluoroacetyl chloride	359-06-8	10	10				
Ethylene fluorohydrin	371-62-0	10	10				
Ergotamine tartrate	379-79-3	500/10,000	500				
1,2-Dichloro-1,1,2,3,3-pentafluoropropane	422-44-6				313		
HCFC-225bb	422-44-6				X		
2,3-Dichloro-1,1,1,2,3-pentafluoropropane	422-48-0				313		

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
HCFC-225ba	422-48-0				X		
3,3-Dichloro-1,1,1,2,2-pentafluoropropane	422-56-0				313		
HCFC-225ca	422-56-0				X		
1,2-Dichloro-1,1,3,3,3-pentafluoropropane	431-86-7				313		
HCFC-225da	431-86-7				X		
Cyanogen	460-19-5			100		P031	10,000
Ethanedinitrile	460-19-5			100		P031	10,000
3-Chloro-1,1,1-trifluoropropane	460-35-5				313		
HCFC-253fb	460-35-5				X		
1,2-Propadiene	463-49-0						10,000
Propadiene	463-49-0						10,000
Carbon oxide sulfide (COS)	463-58-1			100	X		10,000
Carbonyl sulfide	463-58-1			100	313		10,000
2,2-Dimethylpropane	463-82-1						10,000
Propane, 2,2-dimethyl-	463-82-1						10,000
Isodrin	465-73-6	100/10,000	1	1	313^	P060	
Chlorfenvinfos	470-90-6	500	500				
Auramine	492-80-8			100	X	U014	
C.I. Solvent Yellow 34	492-80-8			100	313	U014	
Chlornaphazine	494-03-1			100		U026	
Diaminotoluene	496-72-0			10		U221	
Methylmercuric dicyanamide	502-39-6	500/10,000	500		313c		
4-Aminopyridine	504-24-5	500/10,000	1,000	1,000		P008	
Pyridine, 4-amino-	504-24-5	500/10,000	1,000	1,000		P008	
1,3-Pentadiene	504-60-9			100		U186	10,000
Ethane, 1,1'-thiobis[2-chloro-	505-60-2	500	500		X		
Mustard gas	505-60-2	500	500		313		
Potassium silver cyanide	506-61-6	500	1	1	313c	P099	
Silver cyanide	506-64-9			1	313c	P104	
Cyanogen bromide	506-68-3	500/10,000	1,000	1,000	313c	U246	
Cyanogen chloride	506-77-4			10	313c	P033	10,000
Cyanogen chloride ((CN)Cl)	506-77-4			10	313c	P033	10,000
Cyanogen iodide	506-78-5	1,000/10,000	1,000		313c		
Ammonium carbonate	506-87-6			5,000			
Acetyl bromide	506-96-7			5,000			
1,3-Dichloro-1,1,2,2,3-pentafluoropropane	507-55-1				313		
HCFC-225cb	507-55-1				X		
Methane, tetranitro-	509-14-8	500	10	10		P112	10,000
Tetranitromethane	509-14-8	500	10	10		P112	10,000
Benzeneacetic acid, 4-chloro-.alpha.-(4-chlorophenyl)-.alpha.-hydroxy-, ethyl ester	510-15-6			10	X	U038	
Chlorobenzilate	510-15-6			10	313	U038	
sec-Butylamine	513-49-5			1,000			
Dithiazanine iodide	514-73-8	500/10,000	500				
o-Dinitrobenzene	528-29-0			100	313		
2-Chloroacetophenone	532-27-4			100	313		
Dazomet	533-74-4				313		
Tetrahydro-3,5-dimethyl-2H-1,3,5-thiadiazine-2-thione	533-74-4				X		

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Bis(chloromethyl) ketone	534-07-6	10/10,000	10				
4,6-Dinitro-o-cresol	534-52-1	10/10,000	10	10	313	P047	
4,6-Dinitro-o-cresol and salts	534-52-1			10		P047	
Dinitrocresol	534-52-1	10/10,000	10	10	X	P047	
Crimidine	535-89-7	100/10,000	100				
Ethylbis(2-chloroethyl)amine	538-07-8	500	500				
1,2-Dichloroethylene	540-59-0				313		
Hydrazine, 1,2-dimethyl-	540-73-8			1		U099	
2,2,4-Trimethylpentane	540-84-1			1,000			
tert-Butyl acetate	540-88-5			5,000			
Uranyl acetate	541-09-3			100			
Lewisite	541-25-3	10	10				
Ethyl chloroformate	541-41-3				313		
2,4-Dithiobiuret	541-53-7	100/10,000	100	100	313	P049	
Dithiobiuret	541-53-7	100/10,000	100	100	X	P049	
1,3-Dichlorobenzene	541-73-1			100	313	U071	
Barium cyanide	542-62-1			10	313c	P013	
1,3-Dichloropropene	542-75-6			100	X	U084	
1,3-Dichloropropylene	542-75-6			100	313	U084	
3-Chloropropionitrile	542-76-7	1,000	1,000	1,000	313	P027	
Propionitrile, 3-chloro-	542-76-7	1,000	1,000	1,000	X	P027	
Bis(chloromethyl) ether	542-88-1	100	10	10	313	P016	1,000
Chloromethyl ether	542-88-1	100	10	10	X	P016	1,000
Dichloromethyl ether	542-88-1	100	10	10	X	P016	1,000
Methane, oxybis[chloro-	542-88-1	100	10	10	X	P016	1,000
Ethylthiocyanate	542-90-5	10,000	10,000				
Cadmium acetate	543-90-8			10	313c		
Cobaltous formate	544-18-3			1,000	313c		
Copper cyanide	544-92-3			10	313c	P029	
Lithium carbonate	554-13-2				313		
m-Nitrophenol	554-84-7			100			
Tris(2-chloroethyl)amine	555-77-1	100	100				
Isothiocyanatomethane	556-61-6	500	500		X		
Methyl isothiocyanate	556-61-6	500	500		313		
Methyl thiocyanate	556-64-9	10,000	10,000				20,000
Thiocyanic acid, methyl ester	556-64-9	10,000	10,000				20,000
Nickel cyanide	557-19-7			10	313c	P074	
Zinc cyanide	557-21-1			10	313c	P121	
Zinc acetate	557-34-6			1,000	313c		
Zinc formate	557-41-5			1,000	313c		
1-Propene, 2-chloro-	557-98-2						10,000
2-Chloropropylene	557-98-2						10,000
Methanesulfonyl fluoride	558-25-8	1,000	1,000				
Ethion	563-12-2	1,000	10	10			
Semicarbazide hydrochloride	563-41-7	1,000/10,000	1,000				
3-Methyl-1-butene	563-45-1						10,000
2-Methyl-1-butene	563-46-2						10,000
3-Chloro-2-methyl-1-propene	563-47-3				313		
Thallium(I) acetate	563-68-8			100	313c	U214	
C.I. Basic Green 4	569-64-2				313		
2,6-Dinitrophenol	573-56-8			10			
Benzene, 2,4-diisocyanato-1-methyl-	584-84-9	500	100	100	X		10,000

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Toluene-2,4-diisocyanate	584-84-9	500	100	100	313		10,000
2-Butene-cis	590-18-1						10,000
1-Chloropropylene	590-21-6						10,000
1-Propene, 1-chloro-	590-21-6						10,000
1-Acetyl-2-thiourea	591-08-2			1,000		P002	
Calcium cyanide	592-01-8			10	313c	P021	
Mercuric cyanide	592-04-1			1	313c		
Mercuric thiocyanate	592-85-8			10	313c		
Lead thiocyanate	592-87-0			10	313c		
Vinyl bromide	593-60-2			100	313		
Methanesulfenyl chloride, trichloro-	594-42-3	500	100	100	X		10,000
Perchloromethyl mercaptan	594-42-3	500	100	100	313		10,000
Trichloromethanesulfenyl chloride	594-42-3	500	100	100	X		10,000
Tetraethyltin	597-64-8	100	100				
Bromoacetone	598-31-2			1,000		P017	
Bromotrifluoroethylene	598-73-2						10,000
Ethene, bromotrifluoro-	598-73-2						10,000
2,6-Dinitrotoluene	606-20-2			100	313	U106	
Hexachlorocyclohexane (all isomers)	608-73-1			***			
Pentachlorobenzene	608-93-5			10	313^	U183	
3,4,5-Trichlorophenol	609-19-8			10			
3,4-Dinitrotoluene	610-39-9			10			
3,3'-Dimethylbenzidine dihydrochloride	612-82-8				313		
o-Tolidine dihydrochloride	612-82-8				X		
3,3'-Dichlorobenzidine dihydrochloride	612-83-9				313		
Thiourea, (2-methylphenyl)-	614-78-8	500/10,000	500				
2,4-Diaminoanisole	615-05-4				313		
1,2-Phenylenediamine dihydrochloride	615-28-1				313		
N-Nitroso-N-methylurethane	615-53-2			1		U178	
Di-n-propylnitrosamine	621-64-7			10	X	U111	
N-Nitrosodi-n-propylamine	621-64-7			10	313	U111	
1,4-Phenylenediamine dihydrochloride	624-18-0				313		
2-Butene, (E)	624-64-6						10,000
2-Butene-trans	624-64-6						10,000
Methane, isocyanato-	624-83-9	500	10	10	X	P064	10,000
Methyl isocyanate	624-83-9	500	10	10	313	P064	10,000
tert-Amyl acetate	625-16-1			5,000			
sec-Amyl acetate	626-38-0			5,000			
Chloroethyl chloroformate	627-11-2	1,000	1,000				
2-Pentene, (Z)-	627-20-3						10,000
Amyl acetate	628-63-7			5,000			
Mercury fulminate	628-86-4			10	313c	P065	
Selenourea	630-10-4			1,000		P103	
1,1,1,2-Tetrachloroethane	630-20-6			100	313	U208	
Ethane, 1,1,1,2-tetrachloro-	630-20-6			100	X	U208	
Ouabain	630-60-4	100/10,000	100				
Ammonium acetate	631-61-8			5,000			
o-Toluidine hydrochloride	636-21-5			100	313	U222	
Triphenyltin chloride	639-58-7	500/10,000	500		313		
Fluoroacetamide	640-19-7	100/10,000	100	100		P057	
Dimetilan	644-64-4	500/10,000	1*	1*		P191	
2-Pentene, (E)-	646-04-8						10,000

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Cyanuric fluoride	675-14-9	100	100		313c		
Methyl phosphonic dichloride	676-97-1	100	100				
Hexamethylphosphoramide	680-31-9			1	313		
N-Nitroso-N-methylurea	684-93-5			1	313	U177	
1-Buten-3-yne	689-97-4						10,000
Vinyl acetylene	689-97-4						10,000
Diethylarsine	692-42-2			1		P038	
Dichlorophenylarsine	696-28-6	500	1	1		P036	
Phenyl dichloroarsine	696-28-6	500	1	1		P036	
N-(3,4-Dichlorophenyl)propanamide	709-98-8				X		
Propanil	709-98-8				313		
Phosmet	732-11-6	10/10,000	10				
Hexaethyl tetraphosphate	757-58-4			100		P062	
N-Nitroso-N-ethylurea	759-73-9			1	313	U176	
EPTC	759-94-4				X		
Ethyl dipropylthiocarbamate	759-94-4				313		
Methacrylic anhydride	760-93-0	500	500				
1,4-Dichloro-2-butene	764-41-0			1	313	U074	
2-Butene, 1,4-dichloro-	764-41-0			1	X	U074	
Glycidylaldehyde	765-34-4			10		U126	
Carbophenothion	786-19-6	500	500				
1,1-Dichloro-1,2,2-trifluoroethane	812-04-4				313		
HCFC-123b	812-04-4				X		
Diethyl chlorophosphate	814-49-3	500	500				
2-Propenoyl chloride	814-68-6	100	100				5,000
Acrylyl chloride	814-68-6	100	100				5,000
Cupric tartrate	815-82-7			100	313c		
Hexamethylene-1,6-diisocyanate	822-06-0			100	313#		
Diaminotoluene	823-40-5			10		U221	
Trimethylolpropane phosphite	824-11-3	100/10,000	100				
Ametryn	834-12-8				313		
N-Ethyl-N'-(1-methylethyl)-6-(methylthio)-1,3,5,-triazine-2,4-diamine	834-12-8				X		
C.I. Solvent Yellow 14	842-07-9				313		
N-Methyl-2-pyrrolidone	872-50-4				313		
Stannane, acetoxytriphenyl-	900-95-8	500/10,000	500				
Demeton-S-methyl	919-86-8	500	500				
Methacryloyl chloride	920-46-7	100	100				
N-Nitrosodi-n-butylamine	924-16-3			10	313	U172	
N-Methylolacrylamide	924-42-5				313		
N-Nitrosopyrrolidine	930-55-2			1		U180	
2,3,6-Trichlorophenol	933-75-5			10	313c		
2,3,5-Trichlorophenol	933-78-8			10	313c		
Fonofos	944-22-9	500	500				
Phosfolan	947-02-4	100/10,000	100				
Mephosfolan	950-10-7	500	500				
Methidathion	950-37-8	500/10,000	500				
Diphenamid	957-51-7				313		
alpha - Endosulfan	959-98-8			1			
Phosphoric acid, 2-chloro-1-(2,3,5-trichlorophenyl) ethenyl dimethyl ester	961-11-5				X		
Tetrachlorvinphos	961-11-5				313		

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
C.I. Basic Red 1	989-38-8				313		
Norbormide	991-42-4	100/10,000	100				
Triethoxysilane	998-30-1	500	500				
Chlormequat chloride	999-81-5	100/10,000	100				
Heptachlor epoxide	1024-57-3			1			
Endosulfan sulfate	1031-07-8			1			
Triamiphos	1031-47-6	500/10,000	500				
Chromic acetate	1066-30-4			1,000	313c		
Ammonium bicarbonate	1066-33-7			5,000			
Trimethyltin chloride	1066-45-1	500/10,000	500				
Lead stearate	1072-35-1			10	313c		
Ammonium carbamate	1111-78-0			5,000			
Butylethylcarbamothioic acid S-propyl ester	1114-71-2				X		
Pebulate	1114-71-2				313		
N-Nitrosodiethanolamine	1116-54-7			1		U173	
1,3-Propane sultone	1120-71-4			10	X	U193	
Propane sultone	1120-71-4			10	313	U193	
Nitrocyclohexane	1122-60-7	500	500				
Pyridine, 4-nitro-, 1-oxide	1124-33-0	500/10,000	500				
Metolcarb	1129-41-5	100/10,000	1*	1*		P190	
Cycloate	1134-23-2				313		
Decabromodiphenyl oxide	1163-19-5				313		
Ferric ammonium citrate	1185-57-5			1,000			
Dichlobenil	1194-65-6			100			
Xylenol	1300-71-6			1,000			
Arsenic pentoxide	1303-28-2	100/10,000	1	1	313c	P011	
Arsenic disulfide	1303-32-8			1	313c		
Arsenic trisulfide	1303-33-9			1	313c		
Cadmium oxide	1306-19-0	100/10,000	100		313c		
Antimony trioxide	1309-64-4			1,000	313c		
Potassium hydroxide	1310-58-3			1,000			
Sodium hydroxide	1310-73-2			1,000			
Molybdenum trioxide	1313-27-5				313		
Thorium dioxide	1314-20-1				313		
Thallic oxide	1314-32-5			100	313c	P113	
Vanadium pentoxide	1314-62-1	100/10,000	1,000	1,000	313c	P120	
Sulfur phosphide	1314-80-3			100		U189	
Zinc phosphide	1314-84-7	500	100	100	313c	P122	
Zinc phosphide (conc. <= 10%)	1314-84-7	500	100	100	313c	U249	
Zinc phosphide (conc. > 10%)	1314-84-7	500	100	100	313c	P122	
Lead sulfide	1314-87-0			10	313c		
2,4,5-T amines	1319-72-8			5,000			
Cresol (mixed isomers)	1319-77-3			100	313	U052	
2,4-D Esters	1320-18-9			100	X		
2,4-D propylene glycol butyl ether ester	1320-18-9			100	313		
Nitrotoluene	1321-12-6			1,000			
Arsenic acid	1327-52-2			1	313c	P010	
Arsenic trioxide	1327-53-3	100/10,000	1	1	313c	P012	
Arsenous oxide	1327-53-3	100/10,000	1	1	313c	P012	
Xylene (mixed isomers)	1330-20-7			100	313	U239	
Zinc borate	1332-07-6			1,000	313c		

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Asbestos (friable)	1332-21-4			1	313		
Hydrogen	1333-74-0						10,000
Sodium bifluoride	1333-83-1			100			
Lead subacetate	1335-32-6			10	313c	U146	
Hexachloronaphthalene	1335-87-1				313		
Ammonium hydroxide	1336-21-6			1,000	313		
PCBs	1336-36-3			1	X		
Polychlorinated biphenyls	1336-36-3			1	313^		
Methyl ethyl ketone peroxide	1338-23-4			10		U160	
Naphthenic acid	1338-24-5			100			
Ammonium bifluoride	1341-49-7			100			
Aluminum oxide (fibrous forms)	1344-28-1				313		
Antimycin A	1397-94-0	1,000/10,000	1,000				
Dinoterb	1420-07-1	500/10,000	500				
2,2'-Bioxirane	1464-53-5	500	10	10	X	U085	
Diepoxybutane	1464-53-5	500	10	10	313	U085	
Trichloro(chloromethyl)silane	1558-25-4	100	100				
Carbofuran phenol	1563-38-8			1*		U367	
Carbofuran	1563-66-2	10/10,000	10	10	313	P127	
Benezeneamine, 2,6-dinitro-N,N-dipropyl-4-(trifluoromethyl)-	1582-09-8			10	X		
Trifluralin	1582-09-8			10	313^		
Mercuric acetate	1600-27-7	500/10,000	500		313c		
Hydrazine, 1,2-diethyl-	1615-80-1			10		U086	
Ethanesulfonyl chloride, 2-chloro-	1622-32-8	500	500				
Methyl tert-butyl ether	1634-04-4			1,000	313		
Aldicarb sulfone	1646-88-4			1*		P203	
1,2-Dichloro-1,1-difluoroethane	1649-08-7				313		
HCFC-132b	1649-08-7				X		
3,5-Dibromo-4-hydroxybenzonitrile	1689-84-5				X		
Bromoxynil	1689-84-5				313		
Bromoxynil octanoate	1689-99-2				313		
Octanoic acid, 2,6-dibromo-4-cyanophenyl ester	1689-99-2				X		
1,1-Dichloro-1-fluoroethane	1717-00-6				313		
HCFC-141b	1717-00-6				X		
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	1746-01-6			1	313!^		
Acetone thiosemicarbazide	1752-30-3	1,000/10,000	1,000				
Ammonium thiocyanate	1762-95-4			5,000			
Benzene, 2,4-dichloro-1-(4-nitrophenoxy)-	1836-75-5				X		
Nitrofen	1836-75-5				313		
Benfluralin	1861-40-1				313		
N-Butyl-N-ethyl-2,6-dinitro-4-(trifluoromethyl) benzenamine	1861-40-1				X		
Ammonium benzoate	1863-63-4			5,000			
Hexachloropropene	1888-71-7			1,000		U243	
1,3-Benzenedicarbonitrile, 2,4,5,6-tetrachloro-	1897-45-6				X		
Chlorothalonil	1897-45-6				313		
Paraquat dichloride	1910-42-5	10/10,000	10		313		
6-Chloro-N-ethyl-N'-(1-methylethyl)-	1912-24-9				X		

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
1,3,5-triazine-2,4-diamine							
Atrazine	1912-24-9				313		
3,6-Dichloro-2-methoxybenzoic acid	1918-00-9			1,000	X		
Dicamba	1918-00-9			1,000	313		
Picloram	1918-02-1				313		
2-Chloro-N-(1-methylethyl)-N-phenylacetamide	1918-16-7				X		
Propachlor	1918-16-7				313		
2,4-D Esters	1928-38-7			100			
2,4-D 2-ethylhexyl ester	1928-43-4				313		
2,4,5-T esters	1928-47-8			1,000			
2,4-D Esters	1928-61-6			100			
2,4-D butoxyethyl ester	1929-73-3			100	313		
2,4-D Esters	1929-73-3			100	X		
2-Chloro-6-(trichloromethyl)pyridine	1929-82-4				X		
Nitrapyrin	1929-82-4				313		
C.I. Direct Black 38	1937-37-7				313		
Chloroxuron	1982-47-4	500/10,000	500				
3,6-Dichloro-2-methoxybenzoic acid, sodium salt	1982-69-0				X		
Sodium dicamba	1982-69-0				313		
Tributyltin fluoride	1983-10-4				313		
Valinomycin	2001-95-8	1,000/10,000	1,000				
2,4,5-T amines	2008-46-0			5,000			
Mercaptodimethur	2032-65-7	500/10,000	10	10	X	P199	
Methiocarb	2032-65-7	500/10,000	10	10	313	P199	
Paraquat methosulfate	2074-50-2	10/10,000	10				
Phenylsilatrane	2097-19-0	100/10,000	100				
EPN	2104-64-5	100/10,000	100				
Tributyltin methacrylate	2155-70-6				313		
7-Oxabicyclo(2.2.1)heptane-2,3-dicarboxylic acid, dipotassium salt	2164-07-0				X		
Dipotassium endothall	2164-07-0				313		
Fluometuron	2164-17-2				313		
Urea, N,N-dimethyl-N'-[3-(trifluoromethyl)phenyl]-	2164-17-2				X		
1H-Azepine-1 carbothioic acid, hexahydro-S-ethyl ester	2212-67-1				X		
Molinate	2212-67-1				313		
Cadmium stearate	2223-93-0	1,000/10,000	1,000		313c		
Thiocarbazide	2231-57-4	1,000/10,000	1,000				
Octachloronaphthalene	2234-13-1				313		
Diglycidyl ether	2238-07-5	1,000	1,000				
Prothoate	2275-18-5	100/10,000	100				
Dimethylamine dicamba	2300-66-5				313		
Carbamothioic acid, bis(1-methylethyl)-S-(2,3-dichloro-2-propenyl)ester	2303-16-4			100	X	U062	
Diallate	2303-16-4			100	313	U062	
Triallate	2303-17-5			1*	313	U389	
Propargite	2312-35-8			10	313		
6-Methyl-1,3-dithiolo[4,5-b]quinoxalin-2-one	2439-01-2				X		
Chinomethionat	2439-01-2				313		

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Dodecylguanidine monoacetate	2439-10-3				X		
Dodine	2439-10-3				313		
Oxydisulfoton	2497-07-6	500	500				
Dimethyl chlorothiophosphate	2524-03-0	500	500		313		
Dimethyl phosphorochloridothioate	2524-03-0	500	500		X		
Formothion	2540-82-1	100	100				
2,4,5-T esters	2545-59-7			1,000			
1,4-Cyclohexane diisocyanate	2556-36-7				313#		
Pentadecylamine	2570-26-5	100/10,000	100				
Phosphorothioic acid, O,O-dimethyl-5-(2-(methylthio)ethyl)ester	2587-90-8	500	500				
C.I. Direct Blue 6	2602-46-2				313		
Promecarb	2631-37-0	500/10,000	1*	1*		P201	
Cyanophos	2636-26-2	1,000	1,000				
Azinphos-ethyl	2642-71-9	100/10,000	100				
2,3,5-Trimethylphenyl methylcarbamate	2655-15-4				313		
Phosphonothioic acid, methyl-, O-(4-nitrophenyl) O-phenyl ester	2665-30-7	500	500				
Sulfuryl fluoride	2699-79-8				313		
Vikane	2699-79-8				X		
2,4-D sodium salt	2702-72-9				313		
Phosphonothioic acid, methyl-, O-ethyl O-(4-(methylthio)phenyl) ester	2703-13-1	500	500				
Thallous malonate	2757-18-8	100/10,000	100				
5-(Aminomethyl)-3-isoxazolol	2763-96-4	500/10,000	1,000	1,000		P007	
Muscimol	2763-96-4	500/10,000	1,000	1,000		P007	
Diquat	2764-72-9			1,000			
Endothion	2778-04-3	500/10,000	500				
C.I. Disperse Yellow 3	2832-40-8				313		
2-Chloro-1,1,1,2-tetrafluoroethane	2837-89-0				313		
HCFC-124	2837-89-0				X		
Chlorpyrifos	2921-88-2			1			
Ferric ammonium oxalate	2944-67-4			1,000			
2,4-D chlorocrotyl ester	2971-38-2			100	313		
2,4-D Esters	2971-38-2			100	X		
Ammonium citrate, dibasic	3012-65-5			5,000			
Silane, (4-aminobutyl)diethoxymethyl-	3037-72-7	1,000	1,000				
C.I. Solvent Orange 7	3118-97-6				313		
Ammonium tartrate	3164-29-2			5,000			
4-Chloro-o-toluidine, hydrochloride	3165-93-3			100		U049	
1,5-Naphthalene diisocyanate	3173-72-6				313#		
Cupric nitrate	3251-23-8			100	313c		
Phosphoric acid, dimethyl 4-(methylthio) phenyl ester	3254-63-5	500	500				
1,2,3,4,6,7,8,9-octachlorodibenzo-p-dioxin	3268-87-9				313!^		
O,O-Diethyl S-methyl dithiophosphate	3288-58-2			5,000		U087	
Temephos	3383-96-8				313		
Zinc carbonate	3486-35-9			1,000	313c		
DDE	3547-04-4			5,000			
Sulfoxide, 3-chloropropyl octyl	3569-57-1	500	500				
Benzimidazole, 4,5-dichloro-2-(trifluoromethyl)-	3615-21-2	500/10,000	500				

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
(4-Chloro-2-methylphenoxy) acetate sodium salt	3653-48-3				X		
Methoxone sodium salt	3653-48-3				313		
Sulfotep	3689-24-5	500	100	100		P109	
Tetraethyldithiopyrophosphate	3689-24-5	500	100	100		P109	
Chlorophacinone	3691-35-8	100/10,000	100				
5-Methylchrysene	3697-24-3				313+^		
Amiton oxalate	3734-97-2	100/10,000	100				
Methyl phenkapton	3735-23-7	500	500				
C.I. Food Red 5	3761-53-3				313		
2,4,5-T amines	3813-14-7			5,000			
Fuberidazole	3878-19-1	100/10,000	100				
Bitoscanate	4044-65-9	500/10,000	500				
1-(3-Chloroallyl)-3,5,7-triaza-1-azoniaadamantane chloride	4080-31-3				313		
Isophorone diisocyanate	4098-71-9	100	100		313#		
Phosacetim	4104-14-7	100/10,000	100				
Dichlorosilane	4109-96-0						10,000
Silane, dichloro-	4109-96-0						10,000
4,4'-Diisocyanatodiphenyl ether	4128-73-8				313#		
2-Butenal	4170-30-3	1,000	100	100	X	U053	20,000
Crotonaldehyde	4170-30-3	1,000	100	100	313	U053	20,000
Fluenetil	4301-50-2	100/10,000	100				
Phenol, 2,2'-thiobis[4-chloro-6-methyl-	4418-66-0	100/10,000	100				
N-Nitrosomethylvinylamine	4549-40-0			10	313	P084	
C.I. Acid Green 3	4680-78-8				313		
Hexamethylenediamine, N,N'-dibutyl-	4835-11-4	500	500				
1,1'-Methylene bis(4-isocyanatocyclohexane)	5124-30-1				313#		
5,6-Dihydro-2-methyl-N-phenyl-1,4-oxathiin-3-carboxamide	5234-68-4				X		
Carboxin	5234-68-4				313		
Thiourea, (2-chlorophenyl)-	5344-82-1	100/10,000	100	100		P026	
Dibenzo(a,e)fluoranthene	5385-75-1				313+^		
1-Nitropyrene	5522-43-0				313+^		
Chlorpyrifos methyl	5598-13-0				313		
O,O-Dimethyl-O-(3,5,6-trichloro-2-pyridyl)phosphorothioate	5598-13-0				X		
Coumatetralyl	5836-29-3	500/10,000	500				
Cupric oxalate	5893-66-3			100	313c		
5-Chloro-3-(1,1-dimethylethyl)-6-methyl-2,4(1H,3H)-pyrimidinedione	5902-51-2				X		
Terbacil	5902-51-2				313		
Ethanol, 2,2'-oxybis-, dicarbamate	5952-26-1			1*		U395	
Ammonium oxalate	5972-73-6			5,000			
Ammonium oxalate	6009-70-7			5,000			
2,4,5-T amines	6369-96-6			5,000			
2,4,5-T amines	6369-97-7			5,000			
C.I. Acid Red 114	6459-94-5				313		
Thallium(I) carbonate	6533-73-9	100/10,000	100	100	313c	U215	
Thallous carbonate	6533-73-9	100/10,000	100	100	313c	U215	
Monocrotophos	6923-22-4	10/10,000	10				
4-Chlorophenyl phenyl ether	7005-72-3			5,000			

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
N,N'-Bis(1-methylethyl)-6-methylthio-1,3,5-triazine-2,4-diamine	7287-19-6				X		
Prometryn	7287-19-6				313		
Endrin aldehyde	7421-93-4			1			
Lead stearate	7428-48-0			10	313c		
Aluminum (fume or dust)	7429-90-5				313		
Lead	7439-92-1			10	313^		
Manganese	7439-96-5				313		
Mercury	7439-97-6			1	313^	U151	
Nickel	7440-02-0			100	313		
Silver	7440-22-4			1,000	313		
Sodium	7440-23-5			10			
Thallium	7440-28-0			1,000	313		
Antimony	7440-36-0			5,000	313		
Arsenic	7440-38-2			1	313		
Barium	7440-39-3				313		
Beryllium	7440-41-7			10	313	P015	
Cadmium	7440-43-9			10	313		
Chromium	7440-47-3			5,000	313		
Cobalt	7440-48-4				313		
Copper	7440-50-8			5,000	313		
Vandium (except when contained in an alloy)	7440-62-2				313		
Zinc	7440-66-6			1,000			
Zinc (fume or dust)	7440-66-6			1,000	313		
Selenium dioxide	7446-08-4			10	313c		
Sulfur dioxide	7446-09-5	500	500				
Sulfur dioxide (anhydrous)	7446-09-5	500	500				5,000
Sulfur trioxide	7446-11-9	100	100				10,000
Lead sulfate	7446-14-2			10	313c		
Thallium(I) sulfate	7446-18-6	100/10,000	100	100	313c	P115	
Thallous sulfate	7446-18-6	100/10,000	100	100	313c	P115	
Lead phosphate	7446-27-7			10	313c	U145	
Cupric chloride	7447-39-4			10	313c		
Mercuric chloride	7487-94-7	500/10,000	500		313c		
Selenium sulfide	7488-56-4			10	313c	U205	
Titanium chloride (TiCl4) (T-4)-	7550-45-0	100	1,000	1,000	X		2,500
Titanium tetrachloride	7550-45-0	100	1,000	1,000	313		2,500
Sodium phosphate, dibasic	7558-79-4			5,000			
Lithium hydride	7580-67-8	100	100				
Sodium phosphate, tribasic	7601-54-9			5,000			
Sodium arsenate	7631-89-2	1,000/10,000	1	1	313c		
Sodium bisulfite	7631-90-5			5,000			
Sodium nitrite	7632-00-0			100	313		
Borane, trifluoro-	7637-07-2	500	500		X		5,000
Boron trifluoride	7637-07-2	500	500		313		5,000
Lead arsenate	7645-25-2			1	313c		
Zinc chloride	7646-85-7			1,000	313c		
Hydrochloric acid	7647-01-0			5,000			
Hydrochloric acid (aerosol forms only)	7647-01-0			5,000	313		
Hydrochloric acid (conc 37% or greater)	7647-01-0			5,000			15,000
Hydrogen chloride (anhydrous)	7647-01-0	500	5,000	5,000	X		5,000

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Hydrogen chloride (gas only)	7647-01-0	500	5,000	5,000	X		5,000
Antimony pentachloride	7647-18-9			1,000			
Phosphoric acid	7664-38-2			5,000			
Hydrofluoric acid	7664-39-3	100	100	100	X	U134	
Hydrofluoric acid (conc. 50% or greater)	7664-39-3	100	100	100	X	U134	1,000
Hydrogen fluoride	7664-39-3	100	100	100	313	U134	
Hydrogen fluoride (anhydrous)	7664-39-3	100	100	100	X	U134	1,000
Ammonia	7664-41-7	500	100	100	313		
Ammonia (anhydrous)	7664-41-7	500	100	100	X		10,000
Ammonia (conc 20% or greater)	7664-41-7			1000	X		20,000
Sulfuric acid	7664-93-9	1,000	1,000	1,000			
Sulfuric acid (aerosol forms only)	7664-93-9	1,000	1,000	1,000	313		
Sodium fluoride	7681-49-4			1,000			
Sodium hypochlorite	7681-52-9			100			
2,2-Dimethyl-3-(2-methyl-1-propenyl)cyclopropanecarboxylic acid (1,3,4,5,6,7-hexahydro-1,3-dioxo-2H-isoindol-2-yl)methyl ester	7696-12-0				X		
Tetramethrin	7696-12-0				313		
Nitric acid	7697-37-2	1,000	1,000	1,000	313		
Nitric acid (conc 80% or greater)	7697-37-2	1,000	1,000	1,000	X		15,000
Zinc bromide	7699-45-8			1,000	313c		
Ferric chloride	7705-08-0			1,000			
Nickel chloride	7718-54-9			100	313c		
Phosphorous trichloride	7719-12-2	1,000	1,000	1,000			15,000
Phosphorus trichloride	7719-12-2	1,000	1,000	1,000			15,000
Ferrous sulfate	7720-78-7			1,000			
Potassium permanganate	7722-64-7			100	313c		
Hydrogen peroxide (Conc.> 52%)	7722-84-1	1,000	1,000				
Phosphorus	7723-14-0	100	1	1			
Phosphorus (yellow or white)	7723-14-0	100	1	1	313		
Bromine	7726-95-6	500	500		313		10,000
Zinc sulfate	7733-02-0			1,000	313c		
Chromic acid	7738-94-5			10	313c		
Potassium bromate	7758-01-2				313		
Sodium phosphate, tribasic	7758-29-4			5,000			
Ferrous chloride	7758-94-3			100			
Lead chloride	7758-95-4			10	313c		
Cupric sulfate	7758-98-7			10	313c		
Silver nitrate	7761-88-8			1	313c		
Ammonium sulfamate	7773-06-0			5,000			
Sodium chromate	7775-11-3			10	313c		
Arsenic acid	7778-39-4			1	313c	P010	
Calcium arsenate	7778-44-1	500/10,000	1	1	313c		
Potassium bichromate	7778-50-9			10	313c		
Calcium hypochlorite	7778-54-3			10			
Zinc hydrosulfite	7779-86-4			1,000	313c		
Zinc nitrate	7779-88-6			1,000	313c		
Fluorine	7782-41-4	500	10	10	313	P056	1,000
Selenium	7782-49-2			100	313		
Chlorine	7782-50-5	100	10	10	313		2,500
Ferrous sulfate	7782-63-0			1,000			

NAME	**CAS/ 313 Category Codes**	**Section 302 (EHS) TPQ**	**Section 304 EHS RQ**	**CERCLA RQ**	**Section 313**	**RCRA CODE**	**CAA 112(r) TQ**
Sodium selenite	7782-82-3			100	313c		
Mercurous nitrate	7782-86-7			10	313c		
Selenious acid	7783-00-8	1,000/10,000	10	10	313c	U204	
Hydrogen sulfide	7783-06-4	500	100	100	313s	U135	10,000
Hydrogen selenide	7783-07-5	10	10		313c		500
Mercuric sulfate	7783-35-9			10	313c		
Lead fluoride	7783-46-2			10	313c		
Zinc fluoride	7783-49-5			1,000	313c		
Ferric fluoride	7783-50-8			100			
Antimony trifluoride	7783-56-4			1,000	313c		
Sulfur fluoride (SF4), (T-4)-	7783-60-0	100	100				2,500
Sulfur tetrafluoride	7783-60-0	100	100				2,500
Antimony pentafluoride	7783-70-2	500	500		313c		
Tellurium hexafluoride	7783-80-4	100	100				
Arsenous trichloride	7784-34-1	500	1	1	313c		15,000
Lead arsenate	7784-40-9			1	313c		
Potassium arsenate	7784-41-0			1	313c		
Arsine	7784-42-1	100	100				1,000
Sodium arsenite	7784-46-5	500/10,000	1	1	313c		
Sodium phosphate, tribasic	7785-84-4			5,000			
Mevinphos	7786-34-7	500	10	10	313		
Nickel sulfate	7786-81-4			100	313c		
Beryllium chloride	7787-47-5			1	313c		
Beryllium fluoride	7787-49-7			1	313c		
Beryllium nitrate	7787-55-5			1	313c		
Ammonium chromate	7788-98-9			10	313c		
Potassium chromate	7789-00-6			10	313c		
Strontium chromate	7789-06-2			10	313c		
Ammonium bichromate	7789-09-5			10	313c		
Cadmium bromide	7789-42-6			10	313c		
Cobaltous bromide	7789-43-7			1,000	313c		
Antimony tribromide	7789-61-9			1,000	313c		
Chlorosulfonic acid	7790-94-5			1,000			
Thallium chloride TlCl	7791-12-0	100/10,000	100	100	313c	U216	
Thallous chloride	7791-12-0	100/10,000	100	100	313c	U216	
Chlorine monoxide	7791-21-1						10,000
Chlorine oxide	7791-21-1						10,000
Selenium oxychloride	7791-23-3	500	500		313c		
Phosphine	7803-51-2	500	100	100	313	P096	5,000
Ammonium vanadate	7803-55-6			1,000	313c	P119	
Silane	7803-62-5						10,000
Camphechlor	8001-35-2	500/10,000	1	1	X	P123	
Camphene, octachloro-	8001-35-2	500/10,000	1	1	X	P123	
Toxaphene	8001-35-2	500/10,000	1	1	313^	P123	
Creosote	8001-58-9			1	313	U051	
Dichloropropane - Dichloropropene (mixture)	8003-19-8			100			
Pyrethrins	8003-34-7			1			
Oleum (fuming sulfuric acid)	8014-95-7			1,000			10,000
Sulfuric acid (fuming)	8014-95-7			1,000			10,000
Sulfuric acid, mixture with sulfur trioxide	8014-95-7			1,000			10,000
Demeton	8065-48-3	500	500				

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Metiram	9006-42-2				313		
Polymeric diphenylmethane diisocyanate	9016-87-9				313#		
Sodium hypochlorite	10022-70-5			100			
Chromic chloride	10025-73-7	1/10,000	1		313c		
Silane, trichloro-	10025-78-2						10,000
Trichlorosilane	10025-78-2						10,000
Phosphorus oxychloride	10025-87-3	500	1,000	1,000			5,000
Phosphoryl chloride	10025-87-3	500	1,000	1,000			5,000
Antimony trichloride	10025-91-9			1,000	313c		
Zirconium tetrachloride	10026-11-6			5,000			
Phosphorus pentachloride	10026-13-8	500	500				
Ozone	10028-15-6	100	100		313		
Ferric sulfate	10028-22-5			1,000			
Thallium sulfate	10031-59-1	100/10,000	100	100	313c		
Hydrazine sulfate	10034-93-2				313		
Sodium phosphate, dibasic	10039-32-4			5,000			
Aluminum sulfate	10043-01-3			5,000			
Ferrous ammonium sulfate	10045-89-3			1,000			
Mercuric nitrate	10045-94-0			10	313c		
Chlorine dioxide	10049-04-4				313		1,000
Chlorine oxide (ClO2)	10049-04-4				X		1,000
Chromous chloride	10049-05-5			1,000	313c		
trans-1,3-Dichloropropene	10061-02-6				313		
Lead nitrate	10099-74-8			10	313c		
Chromic sulfate	10101-53-8			1,000	313c		
Lead iodide	10101-63-0			10	313c		
Sodium phosphate, tribasic	10101-89-0			5,000			
Uranyl nitrate	10102-06-4			100			
Sodium selenite	10102-18-8	100/10,000	100	100	313c		
Sodium tellurite	10102-20-2	500/10,000	500				
Nitric oxide	10102-43-9	100	10	10		P076	10,000
Nitrogen oxide (NO)	10102-43-9	100	10	10		P076	10,000
Nitrogen dioxide	10102-44-0	100	10	10		P078	
Thallium(I) nitrate	10102-45-1			100	313c	U217	
Lead arsenate	10102-48-4			1	313c		
Cadmium chloride	10108-64-2			10	313c		
Potassium arsenite	10124-50-2	500/10,000	1	1	313c		
Sodium phosphate, tribasic	10124-56-8			5,000			
Sodium phosphate, dibasic	10140-65-5			5,000			
Ethanol, 1,2-dichloro-, acetate	10140-87-1	1,000	1,000				
Ammonium bisulfite	10192-30-0			5,000			
Ammonium sulfite	10196-04-0			5,000			
Cobalt carbonyl	10210-68-1	10/10,000	10		313c		
2,2-Dibromo-3-nitrilopropionamide	10222-01-2				313s		
Methamidophos	10265-92-6	100/10,000	100				
Borane, trichloro-	10294-34-5	500	500		X		5,000
Boron trichloride	10294-34-5	500	500		313		5,000
Dialifor	10311-84-9	100/10,000	100				
1,4-Bis(methylisocyanate)cyclohexane	10347-54-3				313#		
Sodium phosphate, tribasic	10361-89-4			5,000			
Cupric sulfate, ammoniated	10380-29-7			100	313c		
Mercurous nitrate	10415-75-5			10	313c		

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Ferric nitrate	10421-48-4			1,000			
5-(Phenylmethyl)-3-furanyl)methyl 2,2-dimethyl-3-(2-methyl-1-propenyl)cyclopropanecarboxylate	10453-86-8				X		
Resmethrin	10453-86-8				313		
Methacrolein diacetate	10476-95-6	1,000	1,000				
Nitrogen dioxide	10544-72-6			10			
Sodium bichromate	10588-01-9			10	313c		
Carbendazim	10605-21-7			1*		U372	
Aroclor 1260	11096-82-5			1			
Aroclor 1254	11097-69-1			1			
Aroclor 1221	11104-28-2			1			
Chromic acid	11115-74-5			10	313c		
Aroclor 1232	11141-16-5			1			
Cupric acetoarsenite	12002-03-8	500/10,000	1	1	313c		
Paris green	12002-03-8	500/10,000	1	1			
Selenious acid, dithallium(1+) salt	12039-52-0			1,000	313c	P114	
Nickel hydroxide	12054-48-7			10	313c		
Manganese, tricarbonyl methylcyclopentadienyl	12108-13-3	100	100		313c		
Carbamodithioic acid, 1,2-ethanediylbis-, zinc complex	12122-67-7				X		
Zineb	12122-67-7				313		
Ammonium fluoride	12125-01-8			100			
Ammonium chloride	12125-02-9			5,000			
Ammonium sulfide	12135-76-1			100			
Carbamodithioic acid, 1,2-ethanediylbis-, manganese complex	12427-38-2				X		
Maneb	12427-38-2				313		
Aroclor 1248	12672-29-6			1			
Aroclor 1016	12674-11-2			1			
Sulfur monochloride	12771-08-3			1,000			
Terbufos	13071-79-9	100	100				
Phosphamidon	13171-21-6	100	100				
Ethoprop	13194-48-4	1,000	1,000		313		
Ethoprophos	13194-48-4	1,000	1,000		X		
Phosphorodithioic acid O-ethyl S,S-dipropyl ester	13194-48-4	1,000	1,000		X		
Fenbutatin oxide	13356-08-6				313		
Hexakis(2-methyl-2-phenylpropyl)distannoxane	13356-08-6				X		
Sodium selenate	13410-01-0	100/10,000	100		313c		
Gallium trichloride	13450-90-3	500/10,000	500				
Nickel carbonyl	13463-39-3	1	10	10	313c	P073	1,000
Iron carbonyl (Fe(CO)5), (TB-5-11)-	13463-40-6	100	100		X		2,500
Iron, pentacarbonyl-	13463-40-6	100	100		313		2,500
1,1-Dichloro-1,2,2,3,3-pentafluoropropane	13474-88-9				313		
HCFC-225cc	13474-88-9				X		
2,4,5-T salts	13560-99-1			1,000			
Beryllium nitrate	13597-99-4			1	313c		
Desmedipham	13684-56-5				313		
Zirconium nitrate	13746-89-9			5,000			

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Calcium chromate	13765-19-0			10	313c	U032	
Lead fluoborate	13814-96-5			10	313c		
Ammonium fluoborate	13826-83-0			5,000			
sec-Butylamine	13952-84-6			1,000			
Cobaltous sulfamate	14017-41-5			1,000	313c		
Salcomine	14167-18-1	500/10,000	500				
Nickel nitrate	14216-75-2			100	313c		
Ammonium oxalate	14258-49-2			5,000			
Lithium chromate	14307-35-8			10	313c		
Ammonium tartrate	14307-43-8			5,000			
Ferbam	14484-64-1				313		
Tris(dimethylcarbamodithioato-S,S')iron	14484-64-1				X		
Zinc ammonium chloride	14639-97-5			1,000	313c		
Zinc ammonium chloride	14639-98-6			1,000	313c		
Zirconium sulfate	14644-61-2			5,000			
Bicyclo[2.2.1]heptane-2-carbonitrile, 5-chloro-6-((((methylamino)carbonyl)oxy)imino)-,(1-alpha,2-beta,4-alpha,5-alpha,6E))-	15271-41-7	500/10,000	500				
Manganese, bis(dimethylcarbamodithioato-S,S')-	15339-36-3			1*	313c	P196	
2,4,4-Trimethylhexamethylene diisocyanate	15646-96-5				313#		
Nickel ammonium sulfate	15699-18-0			100	313c		
Lead sulfate	15739-80-7			10	313c		
2,3,4-Trichlorophenol	15950-66-0			10	313c		
Alachlor	15972-60-8				313		
C.I. Direct Brown 95	16071-86-6				313		
N-Nitrosonornicotine	16543-55-8				313		
Sodium hydrosulfide	16721-80-5			5,000			
Ethanimidothioic acid, N-[[methylamino)carbonyl]	16752-77-5	500/10,000	100	100		P066	
Methomyl	16752-77-5	500/10,000	100	100		P066	
Zinc silicofluoride	16871-71-9			5,000	313c		
Ammonium silicofluoride	16919-19-0			1,000			
Zirconium potassium fluoride	16923-95-8			1,000			
2,2,4-Trimethylhexamethylene diisocyanate	16938-22-0				313#		
Decaborane(14)	17702-41-9	500/10,000	500				
Formparanate	17702-57-7	100/10,000	1*	1*		P197	
Benomyl	17804-35-2			1*	313	U271	
Streptozotocin	18883-66-4			1		U206	
4-(Dipropylamino)-3,5-dinitrobenzenesulfonamide	19044-88-3				X		
Oryzalin	19044-88-3				313		
Diborane	19287-45-7	100	100				2,500
Diborane(6)	19287-45-7	100	100				2,500
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin	19408-74-3				313!^		
Pentaborane	19624-22-7	500	500				
3-(2,4-Dichloro-5-(1-methylethoxy)phenyl)-5-(1,1-dimethylethyl)-1,3,4-oxadiazol-2(3H)-one	19666-30-9				X		
Oxydiazon	19666-30-9				313		

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3,3'-Dimethoxybenzidine dihydrochloride	20325-40-0				313		
o-Dianisidine dihydrochloride	20325-40-0				X		
2-(3,4-Dichlorophenyl)-4-methyl-1,2,4-oxadiazolidine-3,5-dione	20354-26-1				X		
Methazole	20354-26-1				313		
Osmium oxide OsO4 (T-4)-	20816-12-0			1,000	X	P087	
Osmium tetroxide	20816-12-0			1,000	313	P087	
Digoxin	20830-75-5	10/10,000	10				
Daunomycin	20830-81-3			10		U059	
Aluminum phosphide	20859-73-8	500	100	100	313	P006	
Metribuzin	21087-64-9				313		
Fosthietan	21548-32-3	500	500				
Leptophos	21609-90-5	500/10,000	500				
Cyanazine	21725-46-2				313		
Mercuric oxide	21908-53-2	500/10,000	500		313c		
Chlorthiophos	21923-23-9	500	500				
Fenamiphos	22224-92-6	10/10,000	10				
2,2-Dimethyl-1,3-benzodioxol-4-ol methylcarbamate	22781-23-3			1*	X	U278	
Bendiocarb	22781-23-3			1*	313	U278	
Bendiocarb phenol	22961-82-6			1*		U364	
Oxamyl	23135-22-0	100/10,000	1*	1*		P194	
Formetanate hydrochloride	23422-53-9	500/10,000	1*	1*		P198	
Pirimifos-ethyl	23505-41-1	1,000	1,000				
Thiophanate-methyl	23564-05-8			1*	313	U409	
(1,2-Phenylenebis(iminocarbonothioyl)) biscarbamic acid diethyl ester	23564-06-9				X		
Thiophanate ethyl	23564-06-9				313		
Benzamide, 3,5-dichloro-N-(1,1-dimethyl-2-propynyl	23950-58-5			5,000	X	U192	
Pronamide	23950-58-5			5,000	313	U192	
Triazofos	24017-47-8	500	500				
Chlormephos	24934-91-6	500	500				
Dinitrobenzene (mixed isomers)	25154-54-5			100			
Nitrophenol (mixed isomers)	25154-55-6			100			
Sodium dodecylbenzenesulfonate	25155-30-0			1,000			
Butene	25167-67-3						10,000
Trichlorophenol	25167-82-2			10	313c		
2,4,5-T esters	25168-15-4			1,000			
2,4-D Esters	25168-26-7			100			
2-((Ethoxyl((1-methylethyl)amino]phosphinothioyl]oxy) benzoic acid 1-methylethyl ester	25311-71-1				X		
Isofenphos	25311-71-1				313		
Dinitrotoluene (mixed isomers)	25321-14-6			10	313		
Dichlorobenzene	25321-22-6			100	X		
Dichlorobenzene (mixed isomers)	25321-22-6			100	313		
Diaminotoluene (mixed isomers)	25376-45-8			10	313	U221	
Toluenediamine	25376-45-8			10	X	U221	
Dinitrophenol	25550-58-7			10			
2,2-Dimethyl-3-(2-methyl-1-propenyl)cyclopropanecarboxylic acid (3-phenoxyphenyl)methyl ester	26002-80-2				X		

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Phenothrin	26002-80-2				313		
Calcium dodecylbenzenesulfonate	26264-06-2			1,000			
Carbamic acid, methyl-, O-(((2,4-dimethyl-1,3-dithiolan-2-yl)methylene)amino)-	26419-73-8	100/10,000	1*	1*		P185	
Benzene, 1,3-diisocyanatomethyl-	26471-62-5			100	X	U223	10,000
Toluene diisocyanate (unspecified isomer)	26471-62-5			100	X	U223	10,000
Toluenediisocyanate (mixed isomers)	26471-62-5			100	313	U223	10,000
Sodium azide (Na(N3))	26628-22-8	500	1,000	1,000	313	P105	
Dichloropropane	26638-19-7			1,000			
N,N'-(1,4-Piperazinediylbis(2,2,2-trichloroethylidene)) bisformamide	26644-46-2				X		
Triforine	26644-46-2				313		
Dichloropropene	26952-23-8			100			
Trichloro(dichlorophenyl)silane	27137-85-5	500	500				
Dodecylbenzenesulfonic acid	27176-87-0			1,000			
4-Chloro-5-(methylamino)-2-[3-(trifluoromethyl)phenyl]-3(2H)-pyridazinone	27314-13-2				X		
Norflurazon	27314-13-2				313		
Triethanolamine dodecylbenzene sulfonate	27323-41-7			1,000			
Vanadyl sulfate	27774-13-6			1,000	313c		
d-trans-Allethrin	28057-48-9				313		
d-trans-Chrysanthemic acid of d-allethrone	28057-48-9				X		
Carbamic acid, diethylthio-, S-(p-chlorobenzyl)	28249-77-6				X		
Thiobencarb	28249-77-6				313		
Antimony potassium tartrate	28300-74-5			100	313c		
Xylylene dichloride	28347-13-9	100/10,000	100				
C.I. Direct Blue 218	28407-37-6				313		
Bromadiolone	28772-56-7	100/10,000	100				
Octachlorostyrene	29082-74-4				313^		
O-(2-(Diethylamino)-6-methyl-4-pyrimidinyl)-O,O-dimethyl phosphorothioate	29232-93-7				X		
Pirimiphos methyl	29232-93-7				313		
Paraformaldehyde	30525-89-4			1,000			
Ethanimidothioic acid, 2-(dimethylamino)-N-hydroxy-2-oxo-, methyl ester	30558-43-1			1*		U394	
Acephate	30560-19-1				313		
Acetylphosphoramidothioic acid O,S-dimethyl ester	30560-19-1				X		
Methacryloyloxyethyl isocyanate	30674-80-7	100	100				
3-((Ethylamino)methoxyphosphinothioyl)oxy)-2-butenoic acid, 1-methylethyl ester	31218-83-4				X		
Propetamphos	31218-83-4				313		
2,4,5-TP esters	32534-95-5			100			
Amitraz	33089-61-1				313		
beta - Endosulfan	33213-65-9			1			

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N-(5-(1,1-Dimethylethyl)-1,3,4-thiadiazol-2-yl)-N,N'-dimethylurea	34014-18-1				X		
Tebuthiuron	34014-18-1				313		
Dichlorotrifluoroethane	34077-87-7				313		
Diflubenzuron	35367-38-5				313		
O-Ethyl O-(4-(methylthio)phenyl)phosphorodithioic acid S-propyl ester	35400-43-2				X		
Sulprofos	35400-43-2				313		
1-(2-(2,4-Dichlorophenyl)-2-(2-propenyloxy)ethyl)-1H-imidazole	35554-44-0				X		
Imazalil	35554-44-0				313		
1-Bromo-1-(bromomethyl)-1,3-propanedicarbonitrile	35691-65-7				313		
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	35822-46-9				313!^		
Uranyl nitrate	36478-76-9			100			
Nickel chloride	37211-05-5			100	313c		
1,3-Bis(methylisocyanate)cyclohexane	38661-72-2				313#		
Diethatyl ethyl	38727-55-8				313		
1,2,3,4,6,7,8,9-octachlorodibenzofuran	39001-02-0				313!^		
2,4-Diaminoanisole sulfate	39156-41-7				313		
Thiofanox	39196-18-4	100/10,000	100	100		P045	
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin	39227-28-6				313!^		
Dinocap	39300-45-3				313		
2,2,3,3-Tetramethylcyclopropane carboxylic acid cyano(3-phenoxyphenyl)methyl ester	39515-41-8				X		
Fenpropathrin	39515-41-8				313		
1,2,3,7,8-pentachlorodibenzo-p-dioxin	40321-76-4				313!^		
N-(1-Ethylpropyl)-3,4-dimethyl-2,6-dinitrobenzenamine	40487-42-1				X		
Pendimethalin	40487-42-1				313^		
O-(4-Bromo-2-chlorophenyl)-O-ethyl-S-propylphosphorothioate	41198-08-7				X		
Profenofos	41198-08-7				313		
3,3'-Dimethylbenzidine dihydrofluoride	41766-75-0				313		
o-Tolidine dihydrofluoride	41766-75-0				X		
Isopropanolamine dodecylbenzene sulfonate	42504-46-1			1,000			
Oxyfluorfen	42874-03-3				313		
1-(4-Chlorophenoxy)-3,3-dimethyl-1-(1H-1,2,4-triazol-1-yl)-2-butanone	43121-43-3				X		
Triadimefon	43121-43-3				313		
3-(3,5-Dichlorophenyl)-5-ethenyl-5-methyl-2,4-oxazolidinedione	50471-44-8				X		
Vinclozolin	50471-44-8				313		
Phosphonothioic acid, methyl-, S-(2-(bis(1-methylethyl)amino)ethyl) O-ethyl ester	50782-69-9	100	100				
2,3,7,8-tetrachlorodibenzofuran	51207-31-9				313!^		
Hexazinone	51235-04-2				313		
2-(4-(2,4-Dichlorophenoxy)phenoxy)propanoic acid, methyl ester	51338-27-3				X		

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Diclofop methyl	51338-27-3				313		
4-Chloro-alpha-(1-methylethyl)benzeneacetic acid cyano(3-phenoxyphenyl)methyl ester	51630-58-1				X		
Fenvalerate	51630-58-1				313		
Zinc ammonium chloride	52628-25-8			1,000	313c		
3-(2,2-Dichloroethenyl)-2,2-dimethylcyclopropane carboxylic acid, (3-phenoxy-phenyl)methyl ester	52645-53-1				X		
Permethrin	52645-53-1				313		
Lead stearate	52652-59-2			10	313c		
Calcium arsenite	52740-16-6			1	313c		
Carbamothioic acid, dipropyl-, S-(phenylmethyl) ester	52888-80-9			1*		U387	
2,4-(1H,3H)-Pyrimidinedione, 5-bromo-6-methyl-3-(1-methylpropyl), lithium salt	53404-19-6				X		
Bromacil, lithium salt	53404-19-6				313		
2,4-D 2-ethyl-4-methylpentyl ester	53404-37-8				313		
Dazomet, sodium salt	53404-60-7				313		
Tetrahydro-3,5-dimethyl-2H-1,3,5-thiadiazine-2-thione, ion(1-), sodium	53404-60-7				X		
2,4-D Esters	53467-11-1			100			
Aroclor 1242	53469-21-9			1			
Pyriminil	53558-25-1	100/10,000	100				
Carbosulfan	55285-14-8			1*		P189	
2,3,-Dihydro-5,6-dimethyl-1,4-dithiin 1,1,4,4-tetraoxide	55290-64-7				X		
Dimethipin	55290-64-7				313		
3-Iodo-2-propynyl butylcarbamate	55406-53-6				313		
Ferric ammonium oxalate	55488-87-4			1,000			
1,2,3,4,7,8,9-heptachlorodibenzofuran	55673-89-7				313!^		
Lead stearate	56189-09-4			10	313c		
2,3,4,7,8-pentachlorodibenzofuran	57117-31-4				313!^		
1,2,3,7,8-pentachlorodibenzofuran	57117-41-6				313!^		
1,2,3,6,7,8-hexachlorodibenzofuran	57117-44-9				313!^		
Triclopyr triethylammonium salt	57213-69-1				313		
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin	57653-85-7				313!^		
Zinc, dichloro(4,4-dimethyl-5((((methylamino)carbonyl)oxy)imino)pentanenitrile)-, (T-4)-	58270-08-9	100/10,000	100		313c		
Thiodicarb	59669-26-0			1*	313	U410	
.alpha.-(2-Chlorophenyl)-.alpha.-4-chlorophenyl)-5-pyrimidinemethanol	60168-88-9				X		
Fenarimol	60168-88-9				313		
1-(2-(2,4-Dichlorophenyl)-4-propyl-1,3-dioxolan-2-yl)-methyl-1H-1,2,4,-triazole	60207-90-1				X		
Propiconazole	60207-90-1				313		
2,3,4,6,7,8-hexachlorodibenzofuran	60851-34-5				313!^		
2,4,5-T esters	61792-07-2			1,000			
Cobalt, ((2,2'-(1,2-ethanediylbis(nitrilomethylidyne))bis(6-fluorophenylato))(2-)-N,N',O,O')-	62207-76-5	100/10,000	100		313c		
5-(2-Chloro-4-(trifluoromethyl)phenoxy)-2-nitrobenzoic acid, sodium salt	62476-59-9				X		

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Acifluorfen, sodium salt	62476-59-9				313		
Chlorotetrafluoroethane	63938-10-3				313		
2-Chloro-N-(((4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl)benzenesulfonamide	64902-72-3				X		
Chlorsulfuron	64902-72-3				313		
3,3'-Dichlorobenzidine sulfate	64969-34-2				313		
2-(4-((6-Chloro-2-benzoxazolylen)oxy)phenoxy)propanoic acid, ethyl ester	66441-23-4				X		
Fenoxaprop ethyl	66441-23-4				313		
Hydramethylnon	67485-29-4				313		
Tetrahydro-5,5-dimethyl-2(1H)-pyrimidinone(3-(4-(trifluoromethyl)phenyl)-1-(2-(4-(trifluoromethyl)phenyl)ethenyl)-2-propenylidene)hydrazone	67485-29-4				X		
1,2,3,4,6,7,8-heptachlorodibenzofuran	67562-39-4				313!^		
3-(2-Chloro-3,3,3-trifluoro-1-propenyl)-2,2-dimethylcyclopropanecarboxylic acid cyano(3-phenoxyphenyl) methyl ester	68085-85-8				X		
Cyhalothrin	68085-85-8				313		
3-(2,2-Dichloroethenyl)-2,2-dimethylcyclopropanecarboxylic acid, cyano(4-fluoro-3-phenoxyphenyl)methyl ester	68359-37-5				X		
Cyfluthrin	68359-37-5				313		
Fluvalinate	69409-94-5				313		
N-(2-Chloro-4-(trifluoromethyl)phenyl)-DL-valine(+)-cyano(3-phenoxyphenyl)methyl ester	69409-94-5				X		
2-(4-((5-(Trifluoromethyl)-2-pyridinyl)oxy)-phenoxy)propanoic acid, butyl ester	69806-50-4				X		
Fluazifop butyl	69806-50-4				313		
1,2,3,4,7,8-hexachlorodibenzofuran	70648-26-9				313!^		
Abamectin	71751-41-2				313		
Avermectin B1	71751-41-2				X		
5-(2-Chloro-4-(trifluoromethyl)phenoxy)-N-methylsulfonyl)-2-nitrobenzamide	72178-02-0				X		
Fomesafen	72178-02-0				313		
(2-(4-Phenoxyphenoxy)ethyl carbamic acid ethyl ester	72490-01-8				X		
Fenoxycarb	72490-01-8				313		
1,2,3,7,8,9-hexachlorodibenzofuran	72918-21-9				313!^		
2-(1-(Ethoxyimino) butyl)-5-(2-(ethylthio)propyl)-3-hydroxyl-2-cyclohexen-1-one	74051-80-2				X		
Sethoxydim	74051-80-2				313		
4-Methyldiphenylmethane-3,4-diisocyanate	75790-84-0				313#		
2,4'-Diisocyanatodiphenyl sulfide	75790-87-3				313#		
2-(4-((6-Chloro-2-quinoxalinyl)oxy]phenoxy) propanoic acid ethyl ester	76578-14-8				X		

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Quizalofop-ethyl	76578-14-8				313		
5-(2-Chloro-4-(trifluoromethyl)phenoxy)-2-nitro-2-ethoxy-1-methyl-2-oxoethyl ester	77501-63-4				X		
Benzoic acid, 5-(2-chloro-4-(trifluoromethyl)phenoxy)-2-nitro-, 2-ethoxy-1-methyl-2-oxethyl ester	77501-63-4				313		
Lactofen	77501-63-4				313		
Bifenthrin	82657-04-3				313		
.alpha.-Butyl-.alpha.-(4-chlorophenyl)-1H-1,2,4-triazole-1-propanenitrile	88671-89-0				X		
Myclobutanil	88671-89-0				313		
Dichloro-1,1,2-trifluoroethane	90454-18-5				313		
Chlorimuron ethyl	90982-32-4				313		
Ethyl-2-(((((4-chloro-6-methoxyprimidin-2-yl)amino)carbonyl)amino)sulfonyl)benzoate	90982-32-4				X		
2-(4-Methoxy-6-methyl-1,3,5-triazin-2-yl)-methylamino)carbonyl)amino)sulfonyl)benzoic acid, methyl ester	101200-48-0				X		
Tribenuron methyl	101200-48-0				313		
1,1-Dichloro-1,2,3,3,3-pentafluoropropane	111512-56-2				313		
HCFC-225eb	111512-56-2				X		
3,3'-Dimethoxybenzidine hydrochloride	111984-09-9				313		
o-Dianisidine hydrochloride	111984-09-9				X		
Dichloropentafluoropropane	127564-92-5				313		
2,2-Dichloro-1,1,1,3,3-pentafluoropropane	128903-21-9				313		
HCFC-225aa	128903-21-9				X		
Diethyldiisocyanatobenzene	134190-37-7				313#		
1,3-Dichloro-1,1,2,3,3-pentafluoropropane	136013-79-1				313		
HCFC-225ea	136013-79-1				X		
Antimony Compounds	N010			***	313		
Arsenic Compounds	N020			***	313		
Barium Compounds	N040				313		
--Except Barium Sulfate (under 313)	0						
Beryllium Compounds	N050			***	313		
Cadmium Compounds	N078			***	313		
Chlorinated Phenols	N084			***	313		
Chlorophenols	N084			***	313		
Chromium Compounds	N090			***	313		
Cobalt Compounds	N096			***	313		
Copper Compounds	N100			***	313		
--Except C.I. Pigment Blue 15 (under 313)	0						
--Except C.I. Pigment Green 36 (under 313)	0						
--Except C.I. Pigment Green 7 (under 313)	0						
--Except copper phthalocyanine compounds (under 313)	0						

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Cyanide Compounds	N106			***	313		
Diisocyanates (includes only 20 chemicals)	N120				313		
Dioxin and dioxin-like compounds (includes only 17 chemicals)	N150				313^		
Ethylenebisdithiocarbamic acid, salts and esters	N171				313		
Glycol Ethers	N230			***	313		
Lead Compounds	N420			***	313^		
Manganese Compounds	N450			***	313		
Mercury Compounds	N458			***	313^		
Nickel Compounds	N495			***	313		
Nicotine and salts	N503				313		
Nitrate compounds (water dissociable)	N511				313		
Polybrominated Biphenyls (PBBs)	N575				313		
Polychlorinated alkanes (C10 to C13)	N583				313		
Polycyclic aromatic compounds (includes only 19 chemicals)	N590				313^		
Selenium Compounds	N725			***	313		
Silver Compounds	N740			***	313		
Strychnine and salts	N746				313		
Thallium Compounds	N760			***	313		
Vandium Compounds	N770				313		
Warfarin and salts	N874				313		
Zinc Compounds	N982			***	313		

LIST OF LISTS
CONSOLIDATED LIST OF CHEMICALS (BY NAME) SUBJECT TO THE EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT (EPCRA) AND SECTION 112(r) OF THE CLEAN AIR ACT

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Abamectin	71751-41-2				313		
Acenaphthene	83-32-9			100			
Acenaphthylene	208-96-8			5,000			
Acephate	30560-19-1				313		
Acetaldehyde	75-07-0			1,000	313	U001	10,000
Acetaldehyde, trichloro-	75-87-6			5,000		U034	
Acetamide	60-35-5			100	313		
Acetic acid	64-19-7			5,000			
Acetic acid, (2,4-dichlorophenoxy)-	94-75-7			100	X	U240	
Acetic acid ethenyl ester	108-05-4	1,000	5,000	5,000	X		15,000
Acetic anhydride	108-24-7			5,000			
Acetone	67-64-1			5,000		U002	
Acetone cyanohydrin	75-86-5	1,000	10	10	X	P069	
Acetone thiosemicarbazide	1752-30-3	1,000/10,000	1,000				
Acetonitrile	75-05-8			5,000	313	U003	
Acetophenone	98-86-2			5,000	313	U004	
2-Acetylaminofluorene	53-96-3			1	313	U005	
Acetyl bromide	506-96-7			5,000			
Acetyl chloride	75-36-5			5,000		U006	
Acetylene	74-86-2						10,000
Acetylphosphoramidothioic acid O,S-dimethyl ester	30560-19-1				X		
1-Acetyl-2-thiourea	591-08-2			1,000		P002	
Acifluorfen, sodium salt	62476-59-9				313		
Acrolein	107-02-8	500	1	1	313	P003	5,000
Acrylamide	79-06-1	1,000/10,000	5,000	5,000	313	U007	
Acrylic acid	79-10-7			5,000	313	U008	
Acrylonitrile	107-13-1	10,000	100	100	313	U009	20,000
Acrylyl chloride	814-68-6	100	100				5,000
Adipic acid	124-04-9			5,000			
Adiponitrile	111-69-3	1,000	1,000				
Alachlor	15972-60-8				313		
Aldicarb	116-06-3	100/10,000	1	1	313	P070	
Aldicarb sulfone	1646-88-4			1*		P203	
Aldrin	309-00-2	500/10,000	1	1	313^	P004	
d-trans-Allethrin	28057-48-9				313		
Allyl alcohol	107-18-6	1,000	100	100	313	P005	15,000
Allylamine	107-11-9	500	500		313		10,000
Allyl chloride	107-05-1			1,000	313		
Aluminum (fume or dust)	7429-90-5				313		
Aluminum oxide (fibrous forms)	1344-28-1				313		
Aluminum phosphide	20859-73-8	500	100	100	313	P006	
Aluminum sulfate	10043-01-3			5,000			
Ametryn	834-12-8				313		
2-Aminoanthraquinone	117-79-3				313		
4-Aminoazobenzene	60-09-3				313		
4-Aminobiphenyl	92-67-1			1	313		
1-Amino-2-	82-28-0				313		

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
methylanthraquinone							
5-(Aminomethyl)-3-isoxazolol	2763-96-4	500/10,000	1,000	1,000		P007	
Aminopterin	54-62-6	500/10,000	500				
4-Aminopyridine	504-24-5	500/10,000	1,000	1,000		P008	
Amiton	78-53-5	500	500				
Amiton oxalate	3734-97-2	100/10,000	100				
Amitraz	33089-61-1				313		
Amitrole	61-82-5			10	313	U011	
Ammonia	7664-41-7	500	100	100	313		
Ammonia (anhydrous)	7664-41-7	500	100	100	X		10,000
Ammonia (conc 20% or greater)	7664-41-7			1000	X		20,000
Ammonium acetate	631-61-8			5,000			
Ammonium benzoate	1863-63-4			5,000			
Ammonium bicarbonate	1066-33-7			5,000			
Ammonium bichromate	7789-09-5			10	313c		
Ammonium bifluoride	1341-49-7			100			
Ammonium bisulfite	10192-30-0			5,000			
Ammonium carbamate	1111-78-0			5,000			
Ammonium carbonate	506-87-6			5,000			
Ammonium chloride	12125-02-9			5,000			
Ammonium chromate	7788-98-9			10	313c		
Ammonium citrate, dibasic	3012-65-5			5,000			
Ammonium fluoborate	13826-83-0			5,000			
Ammonium fluoride	12125-01-8			100			
Ammonium hydroxide	1336-21-6			1,000	313		
Ammonium oxalate	5972-73-6			5,000			
Ammonium oxalate	6009-70-7			5,000			
Ammonium oxalate	14258-49-2			5,000			
Ammonium picrate	131-74-8			10		P009	
Ammonium silicofluoride	16919-19-0			1,000			
Ammonium sulfamate	7773-06-0			5,000			
Ammonium sulfide	12135-76-1			100			
Ammonium sulfite	10196-04-0			5,000			
Ammonium tartrate	3164-29-2			5,000			
Ammonium tartrate	14307-43-8			5,000			
Ammonium thiocyanate	1762-95-4			5,000			
Ammonium vanadate	7803-55-6			1,000	313c	P119	
Amphetamine	300-62-9	1,000	1,000				
Amyl acetate	628-63-7			5,000			
iso-Amyl acetate	123-92-2			5,000			
sec-Amyl acetate	626-38-0			5,000			
tert-Amyl acetate	625-16-1			5,000			
Anilazine	101-05-3				313		
Aniline	62-53-3	1,000	5,000	5,000	313	U012	
Aniline, 2,4,6-trimethyl-	88-05-1	500	500				
o-Anisidine	90-04-0			100	313		
p-Anisidine	104-94-9				313		
o-Anisidine hydrochloride	134-29-2				313		
Anthracene	120-12-7			5,000	313		
Antimony	7440-36-0			5,000	313		
Antimony Compounds	N010			***	313		

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Antimony pentachloride	7647-18-9			1,000			
Antimony pentafluoride	7783-70-2	500	500		313c		
Antimony potassium tartrate	28300-74-5			100	313c		
Antimony tribromide	7789-61-9			1,000	313c		
Antimony trichloride	10025-91-9			1,000	313c		
Antimony trifluoride	7783-56-4			1,000	313c		
Antimony trioxide	1309-64-4			1,000	313c		
Antimycin A	1397-94-0	1,000/10,000	1,000				
ANTU	86-88-4	500/10,000	100	100		P072	
Aroclor 1016	12674-11-2			1			
Aroclor 1221	11104-28-2			1			
Aroclor 1232	11141-16-5			1			
Aroclor 1242	53469-21-9			1			
Aroclor 1248	12672-29-6			1			
Aroclor 1254	11097-69-1			1			
Aroclor 1260	11096-82-5			1			
Arsenic	7440-38-2			1	313		
Arsenic acid	1327-52-2			1	313c	P010	
Arsenic acid	7778-39-4			1	313c	P010	
Arsenic Compounds	N020			***	313		
Arsenic disulfide	1303-32-8			1	313c		
Arsenic pentoxide	1303-28-2	100/10,000	1	1	313c	P011	
Arsenic trioxide	1327-53-3	100/10,000	1	1	313c	P012	
Arsenic trisulfide	1303-33-9			1	313c		
Arsenous oxide	1327-53-3	100/10,000	1	1	313c	P012	
Arsenous trichloride	7784-34-1	500	1	1	313c		15,000
Arsine	7784-42-1	100	100				1,000
Asbestos (friable)	1332-21-4			1	313		
Atrazine	1912-24-9				313		
Auramine	492-80-8			100	X	U014	
Avermectin B1	71751-41-2				X		
Azaserine	115-02-6			1		U015	
1H-Azepine-1 carbothioic acid, hexahydro-S-ethyl ester	2212-67-1				X		
Azinphos-ethyl	2642-71-9	100/10,000	100				
Azinphos-methyl	86-50-0	10/10,000	1	1			
Aziridine	151-56-4	500	1	1	X	P054	10,000
Aziridine, 2-methyl	75-55-8	10,000	1	1	X	P067	10,000
Barban	101-27-9			1*		U280	
Barium	7440-39-3				313		
Barium Compounds	N040				313		
--Except Barium Sulfate (under 313)	0						
Barium cyanide	542-62-1			10	313c	P013	
Bendiocarb	22781-23-3			1*	313	U278	
Bendiocarb phenol	22961-82-6			1*		U364	
Benezeneamine, 2,6-dinitro-N,N-dipropyl-4-(trifluoromethyl)-	1582-09-8			10	X		
Benfluralin	1861-40-1				313		
Benomyl	17804-35-2			1*	313	U271	
Benz[c]acridine	225-51-4			100		U016	

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Benzal chloride	98-87-3	500	5,000	5,000	313	U017	
Benzamide	55-21-0				313		
Benzamide, 3,5-dichloro-N-(1,1-dimethyl-2-propynyl	23950-58-5			5,000	X	U192	
Benz[a]anthracene	56-55-3			10	313+^	U018	
Benzenamine, 3-(trifluoromethyl)-	98-16-8	500	500				
Benzene	71-43-2			10	313	U019	
Benzeneacetic acid, 4-chloro-.alpha.-(4-chlorophenyl)-.alpha.-hydroxy-, ethyl ester	510-15-6			10	X	U038	
Benzeneamine, N-hydroxy-N-nitroso, ammonium salt	135-20-6				X		
Benzenearsonic acid	98-05-5	10/10,000	10				
Benzene, 1-(chloromethyl)-4-nitro-	100-14-1	500/10,000	500				
1,3-Benzenedicarbonitrile, 2,4,5,6-tetrachloro-	1897-45-6				X		
Benzene, 2,4-dichloro-1-(4-nitrophenoxy)-	1836-75-5				X		
Benzene, 2,4-diisocyanato-1-methyl-	584-84-9	500	100	100	X		10,000
Benzene, 1,3-diisocyanato-2-methyl-	91-08-7	100	100	100	X		10,000
Benzene, 1,3-diisocyanatomethyl-	26471-62-5			100	X	U223	10,000
Benzene, m-dimethyl-	108-38-3			1,000	X	U239	
Benzene, o-dimethyl-	95-47-6			1,000	X	U239	
Benzene, p-dimethyl-	106-42-3			100	X	U239	
Benzeneethanamine, alpha,alpha-dimethyl-	122-09-8			5,000		P046	
Benzenemethanol, 4-chloro-.alpha.-4-chlorophenyl)-.alpha.-(trichloromethyl)-	115-32-2			10	X		
Benzenesulfonyl chloride	98-09-9			100		U020	
Benzenethiol	108-98-5	500	100	100		P014	
Benzene, 1,1'-(2,2,2-trichloroethylidene)bis [4-methoxy-	72-43-5			1	X	U247	
Benzidine	92-87-5			1	313	U021	
Benzimidazole, 4,5-dichloro-2-(trifluoromethyl)-	3615-21-2	500/10,000	500				
Benzo[b]fluoranthene	205-99-2			1	313+^		
Benzo(j)fluoranthene	205-82-3				313+^		
Benzo(k)fluoranthene	207-08-9			5,000	313+^		
Benzoic acid	65-85-0			5,000			
Benzoic acid, 3-amino-2,5-dichloro-	133-90-4			100	X		
Benzoic acid, 5-(2-chloro-4-(trifluoromethyl)phenoxy)-2-nitro-, 2-ethoxy-1-methyl-2-oxethyl ester	77501-63-4				313		
Benzoic trichloride	98-07-7	100	10	10	313	U023	
Benzonitrile	100-47-0			5,000			
Benzo(rst)pentaphene	189-55-9			10	313+	U064	

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Benzo[g,h,i]perylene	191-24-2			5,000	313^		
Benzo(a)phenanthrene	218-01-9			100	313+^	U050	
Benzo[a]pyrene	50-32-8			1	313+^	U022	
p-Benzoquinone	106-51-4			10	X	U197	
Benzotrichloride	98-07-7	100	10	10	X	U023	
Benzoyl chloride	98-88-4			1,000	313		
Benzoyl peroxide	94-36-0				313		
Benzyl chloride	100-44-7	500	100	100	313	P028	
Benzyl cyanide	140-29-4	500	500				
Beryllium	7440-41-7			10	313	P015	
Beryllium chloride	7787-47-5			1	313c		
Beryllium Compounds	N050			***	313		
Beryllium fluoride	7787-49-7			1	313c		
Beryllium nitrate	7787-55-5			1	313c		
Beryllium nitrate	13597-99-4			1	313c		
alpha-BHC	319-84-6			10	X		
beta-BHC	319-85-7			1			
delta-BHC	319-86-8			1			
Bicyclo[2.2.1]heptane-2-carbonitrile, 5-chloro-6-((((methylamino)carbonyl)oxy)imino)-,(1-alpha,2-beta,4-alpha,5-alpha,6E))-	15271-41-7	500/10,000	500				
Bifenthrin	82657-04-3				313		
2,2'-Bioxirane	1464-53-5	500	10	10	X	U085	
Biphenyl	92-52-4			100	313		
Bis(2-chloroethoxy) methane	111-91-1			1,000	313	U024	
Bis(2-chloroethyl) ether	111-44-4	10,000	10	10	313	U025	
Bis(chloromethyl) ether	542-88-1	100	10	10	313	P016	1,000
Bis(2-chloro-1-methylethyl)ether	108-60-1			1,000	313	U027	
Bis(chloromethyl) ketone	534-07-6	10/10,000	10				
Bis(2-ethylhexyl)phthalate	117-81-7			100	X	U028	
N,N'-Bis(1-methylethyl)-6-methylthio-1,3,5-triazine-2,4-diamine	7287-19-6				X		
1,3-Bis(methylisocyanate)cyclohexane	38661-72-2				313#		
1,4-Bis(methylisocyanate)cyclohexane	10347-54-3				313#		
Bis(tributyltin) oxide	56-35-9				313		
Bitoscanate	4044-65-9	500/10,000	500				
Borane, trichloro-	10294-34-5	500	500		X		5,000
Borane, trifluoro-	7637-07-2	500	500		X		5,000
Boron trichloride	10294-34-5	500	500		313		5,000
Boron trifluoride	7637-07-2	500	500		313		5,000
Boron trifluoride compound with methyl ether (1:1)	353-42-4	1,000	1,000				15,000
Boron, trifluoro[oxybis[methane]]-, (T-4)-	353-42-4	1,000	1,000				15,000
Bromacil	314-40-9				313		

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Bromacil, lithium salt	53404-19-6				313		
Bromadiolone	28772-56-7	100/10,000	100				
Bromine	7726-95-6	500	500		313		10,000
Bromoacetone	598-31-2			1,000		P017	
1-Bromo-1-(bromomethyl)-1,3-propanedicarbonitrile	35691-65-7				313		
Bromochlorodifluoromethane	353-59-3				313		
O-(4-Bromo-2-chlorophenyl)-O-ethyl-S-propylphosphorothioate	41198-08-7				X		
Bromoform	75-25-2			100	313	U225	
Bromomethane	74-83-9	1,000	1,000	1,000	313	U029	
5-Bromo-6-methyl-3-(1-methylpropyl)-2,4-(1H,3H)-pyrimidinedione	314-40-9				X		
4-Bromophenyl phenyl ether	101-55-3			100		U030	
Bromotrifluoroethylene	598-73-2						10,000
Bromotrifluoromethane	75-63-8				313		
Bromoxynil	1689-84-5				313		
Bromoxynil octanoate	1689-99-2				313		
Brucine	357-57-3			100	313	P018	
1,3-Butadiene	106-99-0			10	313		10,000
1,3-Butadiene, 2-methyl-	78-79-5			100			10,000
Butane	106-97-8						10,000
Butane, 2-methyl-	78-78-4						10,000
2-Butenal	4170-30-3	1,000	100	100	X	U053	20,000
2-Butenal, (e)-	123-73-9	1,000	100	100		U053	20,000
Butene	25167-67-3						10,000
1-Butene	106-98-9						10,000
2-Butene	107-01-7						10,000
2-Butene-cis	590-18-1						10,000
2-Butene, 1,4-dichloro-	764-41-0			1	X	U074	
2-Butene, (E)	624-64-6						10,000
2-Butene-trans	624-64-6						10,000
1-Buten-3-yne	689-97-4						10,000
2,4-D butoxyethyl ester	1929-73-3			100	313		
Butyl acetate	123-86-4			5,000			
iso-Butyl acetate	110-19-0			5,000			
sec-Butyl acetate	105-46-4			5,000			
tert-Butyl acetate	540-88-5			5,000			
Butyl acrylate	141-32-2				313		
n-Butyl alcohol	71-36-3			5,000	313	U031	
sec-Butyl alcohol	78-92-2				313		
tert-Butyl alcohol	75-65-0				313		
Butylamine	109-73-9			1,000			
iso-Butylamine	78-81-9			1,000			
sec-Butylamine	513-49-5			1,000			
sec-Butylamine	13952-84-6			1,000			
tert-Butylamine	75-64-9			1,000			
Butyl benzyl phthalate	85-68-7			100			
.alpha.-Butyl-.alpha.-(4-chlorophenyl)-1H-1,2,4-triazole-1-propanenitrile	88671-89-0				X		

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
1,2-Butylene oxide	106-88-7			100	313		
Butylethylcarbamothioic acid S-propyl ester	1114-71-2				X		
N-Butyl-N-ethyl-2,6-dinitro-4-(trifluoromethyl) benzenamine	1861-40-1				X		
n-Butyl phthalate	84-74-2			10	X	U069	
1-Butyne	107-00-6						10,000
Butyraldehyde	123-72-8				313		
Butyric acid	107-92-6			5,000			
iso-Butyric acid	79-31-2			5,000			
Cacodylic acid	75-60-5			1		U136	
Cadmium	7440-43-9			10	313		
Cadmium acetate	543-90-8			10	313c		
Cadmium bromide	7789-42-6			10	313c		
Cadmium chloride	10108-64-2			10	313c		
Cadmium Compounds	N078			***	313		
Cadmium oxide	1306-19-0	100/10,000	100		313c		
Cadmium stearate	2223-93-0	1,000/10,000	1,000		313c		
Calcium arsenate	7778-44-1	500/10,000	1	1	313c		
Calcium arsenite	52740-16-6			1	313c		
Calcium carbide	75-20-7			10			
Calcium chromate	13765-19-0			10	313c	U032	
Calcium cyanamide	156-62-7			1,000	313		
Calcium cyanide	592-01-8			10	313c	P021	
Calcium dodecylbenzenesulfonate	26264-06-2			1,000			
Calcium hypochlorite	7778-54-3			10			
Camphechlor	8001-35-2	500/10,000	1	1	X	P123	
Camphene, octachloro-	8001-35-2	500/10,000	1	1	X	P123	
Cantharidin	56-25-7	100/10,000	100				
Captan	133-06-2			10	313		
Carbachol chloride	51-83-2	500/10,000	500				
Carbamic acid, diethylthio-, S-(p-chlorobenzyl)	28249-77-6				X		
Carbamic acid, ethyl ester	51-79-6			100	X	U238	
Carbamic acid, methyl-, O-(((2,4-dimethyl-1,3-dithiolan-2-yl)methylene)amino)-	26419-73-8	100/10,000	1*	1*		P185	
Carbamodithioic acid, 1,2-ethanediylbis-, manganese complex	12427-38-2				X		
Carbamodithioic acid, 1,2-ethanediylbis-, zinc complex	12122-67-7				X		
Carbamothioic acid, bis(1-methylethyl)-S-(2,3-dichloro-2-propenyl)ester	2303-16-4			100	X	U062	
Carbamothioic acid, dipropyl-, S-(phenylmethyl) ester	52888-80-9			1*		U387	
Carbaryl	63-25-2			100	313	U279	
Carbendazim	10605-21-7			1*		U372	
Carbofuran	1563-66-2	10/10,000	10	10	313	P127	
Carbofuran phenol	1563-38-8			1*		U367	
Carbon disulfide	75-15-0	10,000	100	100	313	P022	20,000
Carbonic difluoride	353-50-4			1,000		U033	

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Carbonic dichloride	75-44-5	10	10	10	X	P095	500
Carbonochloridic acid, methylester	79-22-1	500	1,000	1,000	X	U156	5,000
Carbonochloridic acid, 1-methylethyl ester	108-23-6	1,000	1,000				15,000
Carbonochloridic acid, propylester	109-61-5	500	500				15,000
Carbon oxide sulfide (COS)	463-58-1			100	X		10,000
Carbon tetrachloride	56-23-5			10	313	U211	
Carbonyl sulfide	463-58-1			100	313		10,000
Carbophenothion	786-19-6	500	500				
Carbosulfan	55285-14-8			1*		P189	
Carboxin	5234-68-4				313		
Catechol	120-80-9			100	313		
CFC-11	75-69-4			5,000	X	U121	
CFC-12	75-71-8			5,000	X	U075	
CFC-114	76-14-2				X		
CFC-115	76-15-3				X		
CFC-13	75-72-9				X		
Chinomethionat	2439-01-2				313		
Chloramben	133-90-4			100	313		
Chlorambucil	305-03-3			10		U035	
Chlordane	57-74-9	1,000	1	1	313^	U036	
Chlordane (Technical Mixture and Metabolites)	0			***			
Chlorendic acid	115-28-6				313		
Chlorfenvinfos	470-90-6	500	500				
Chlorimuron ethyl	90982-32-4				313		
Chlorinated Benzenes	0			***			
Chlorinated Ethanes	0			***			
Chlorinated Naphthalene	0			***			
Chlorinated Phenols	N084			***	313		
Chlorine	7782-50-5	100	10	10	313		2,500
Chlorine dioxide	10049-04-4				313		1,000
Chlorine monoxide	7791-21-1						10,000
Chlorine oxide	7791-21-1						10,000
Chlorine oxide (ClO2)	10049-04-4				X		1,000
Chlormephos	24934-91-6	500	500				
Chlormequat chloride	999-81-5	100/10,000	100				
Chlornaphazine	494-03-1			100		U026	
Chloroacetaldehyde	107-20-0			1,000		P023	
Chloroacetic acid	79-11-8	100/10,000	100	100	313		
2-Chloroacetophenone	532-27-4			100	313		
Chloroalkyl Ethers	0			***			
1-(3-Chloroallyl)-3,5,7-triaza-1-azoniaadamantane chloride	4080-31-3				313		
p-Chloroaniline	106-47-8			1,000	313	P024	
Chlorobenzene	108-90-7			100	313	U037	
Chlorobenzilate	510-15-6			10	313	U038	
2-(4-((6-Chloro-2-benzoxazolylen)oxy)phenoxy)propanoic acid, ethyl ester	66441-23-4				X		
2-Chloro-N-(2-chloroethyl)-N-	51-75-2	10	10		X		

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methylethanamine							
p-Chloro-m-cresol	59-50-7			5,000		U039	
2,4-D chlorocrotyl ester	2971-38-2			100	313		
Chlorodibromomethane	124-48-1			100			
1-Chloro-1,1-difluoroethane	75-68-3				313		
Chlorodifluoromethane	75-45-6				313		
5-Chloro-3-(1,1-dimethylethyl)-6-methyl-2,4(1H,3H)-pyrimidinedione	5902-51-2				X		
Chloroethane	75-00-3			100	313		10,000
Chloroethanol	107-07-3	500	500				
Chloroethyl chloroformate	627-11-2	1,000	1,000				
6-Chloro-N-ethyl-N'-(1-methylethyl)-1,3,5-triazine-2,4-diamine	1912-24-9				X		
2-Chloroethyl vinyl ether	110-75-8			1,000		U042	
Chloroform	67-66-3	10,000	10	10	313	U044	20,000
Chloromethane	74-87-3			100	313	U045	10,000
2-Chloro-N-(((4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl)benzenesulfonamide	64902-72-3				X		
4-Chloro-5-(methylamino)-2-[3-(trifluoromethyl)phenyl]-3(2H)-pyridazinone	27314-13-2				X		
Chloromethyl ether	542-88-1	100	10	10	X	P016	1,000
4-Chloro-alpha-(1-methylethyl)benzeneacetic acid cyano(3-phenoxyphenyl)methyl ester	51630-58-1				X		
2-Chloro-N-(1-methylethyl)-N-phenylacetamide	1918-16-7				X		
Chloromethyl methyl ether	107-30-2	100	10	10	313	U046	5,000
(4-Chloro-2-methylphenoxy) acetate sodium salt	3653-48-3				X		
(4-Chloro-2-methylphenoxy) acetic acid	94-74-6				X		
3-Chloro-2-methyl-1-propene	563-47-3				313		
2-Chloronaphthalene	91-58-7			5,000		U047	
Chlorophacinone	3691-35-8	100/10,000	100				
2-Chlorophenol	95-57-8			100		U048	
Chlorophenols	N084			***	313		
1-(4-Chlorophenoxy)-3,3-dimethyl-1-(1H-1,2,4-triazol-1-yl)-2-butanone	43121-43-3				X		
.alpha.-(2-Chlorophenyl)-.alpha.-4-chlorophenyl)-5-pyrimidinemethanol	60168-88-9				X		
p-Chlorophenyl isocyanate	104-12-1				313		
4-Chlorophenyl phenyl ether	7005-72-3			5,000			
Chloropicrin	76-06-2				313		
Chloroprene	126-99-8			100	313		
3-Chloropropionitrile	542-76-7	1,000	1,000	1,000	313	P027	
1-Chloropropylene	590-21-6						10,000
2-Chloropropylene	557-98-2						10,000

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2-(4-((6-Chloro-2-quinoxalinyl)oxy]phenoxy) propanoic acid ethyl ester	76578-14-8				X		
Chlorosulfonic acid	7790-94-5			1,000			
Chlorotetrafluoroethane	63938-10-3				313		
1-Chloro-1,1,2,2-tetrafluoroethane	354-25-6				313		
2-Chloro-1,1,1,2-tetrafluoroethane	2837-89-0				313		
Chlorothalonil	1897-45-6				313		
p-Chloro-o-toluidine	95-69-2				313		
4-Chloro-o-toluidine, hydrochloride	3165-93-3			100		U049	
2-Chloro-6-(trichloromethyl)pyridine	1929-82-4				X		
2-Chloro-1,1,1-trifluoroethane	75-88-7				313		
Chlorotrifluoromethane	75-72-9				313		
5-(2-Chloro-4-(trifluoromethyl)phenoxy)-2-nitrobenzoic acid, sodium salt	62476-59-9				X		
5-(2-Chloro-4-(trifluoromethyl)phenoxy)-N-methylsulfonyl)-2-nitrobenzamide	72178-02-0				X		
5-(2-Chloro-4-(trifluoromethyl)phenoxy)-2-nitro-2-ethoxy-1-methyl-2-oxoethyl ester	77501-63-4				X		
N-(2-Chloro-4-(trifluoromethyl)phenyl)-DL-valine(+)-cyano(3-phenoxyphenyl)methyl ester	69409-94-5				X		
3-Chloro-1,1,1-trifluoropropane	460-35-5				313		
3-(2-Chloro-3,3,3-trifluoro-1-propenyl)-2,2-dimethylcyclopropanecarboxylic acid cyano(3-phenoxyphenyl) methyl ester	68085-85-8				X		
Chloroxuron	1982-47-4	500/10,000	500				
Chlorpyrifos	2921-88-2			1			
Chlorpyrifos methyl	5598-13-0				313		
Chlorsulfuron	64902-72-3				313		
Chlorthiophos	21923-23-9	500	500				
Chromic acetate	1066-30-4			1,000	313c		
Chromic acid	7738-94-5			10	313c		
Chromic acid	11115-74-5			10	313c		
Chromic chloride	10025-73-7	1/10,000	1		313c		
Chromic sulfate	10101-53-8			1,000	313c		
Chromium	7440-47-3			5,000	313		
Chromium Compounds	N090			***	313		
Chromous chloride	10049-05-5			1,000	313c		
d-trans-Chrysanthemic acid of d-allethrone	28057-48-9				X		
Chrysene	218-01-9			100	X	U050	
C.I. Acid Green 3	4680-78-8				313		

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C.I. Acid Red 114	6459-94-5				313		
C.I. Basic Green 4	569-64-2				313		
C.I. Basic Red 1	989-38-8				313		
C.I. Direct Black 38	1937-37-7				313		
C.I. Direct Blue 218	28407-37-6				313		
C.I. Direct Blue 6	2602-46-2				313		
C.I. Direct Brown 95	16071-86-6				313		
C.I. Disperse Yellow 3	2832-40-8				313		
C.I. Food Red 5	3761-53-3				313		
C.I. Food Red 15	81-88-9				313		
C.I. Solvent Orange 7	3118-97-6				313		
C.I. Solvent Yellow 3	97-56-3				313		
C.I. Solvent Yellow 14	842-07-9				313		
C.I. Solvent Yellow 34	492-80-8			100	313	U014	
C.I. Vat Yellow 4	128-66-5				313		
Cobalt	7440-48-4				313		
Cobalt carbonyl	10210-68-1	10/10,000	10		313c		
Cobalt Compounds	N096			***	313		
Cobalt, ((2,2'-(1,2-ethanediylbis(nitrilomethylidyne))bis(6-fluorophenylato))(2-)-N,N',O,O')-	62207-76-5	100/10,000	100		313c		
Cobaltous bromide	7789-43-7			1,000	313c		
Cobaltous formate	544-18-3			1,000	313c		
Cobaltous sulfamate	14017-41-5			1,000	313c		
Coke Oven Emissions	0			1			
Colchicine	64-86-8	10/10,000	10				
Copper	7440-50-8			5,000	313		
Copper Compounds	N100			***	313		
--Except copper phthalocyanine compounds (under 313)	0						
--Except C.I. Pigment Blue 15 (under 313)	0						
--Except C.I. Pigment Green 7 (under 313)	0						
--Except C.I. Pigment Green 36 (under 313)	0						
Copper cyanide	544-92-3			10	313c	P029	
Coumaphos	56-72-4	100/10,000	10	10			
Coumatetralyl	5836-29-3	500/10,000	500				
Creosote	8001-58-9			1	313	U051	
p-Cresidine	120-71-8				313		
m-Cresol	108-39-4			100	313	U052	
o-Cresol	95-48-7	1,000/10,000	100	100	313	U052	
p-Cresol	106-44-5			100	313	U052	
Cresol (mixed isomers)	1319-77-3			100	313	U052	
Crimidine	535-89-7	100/10,000	100				
Crotonaldehyde	4170-30-3	1,000	100	100	313	U053	20,000
Crotonaldehyde, (E)-	123-73-9	1,000	100	100		U053	20,000
Cumene	98-82-8			5,000	313	U055	
Cumene hydroperoxide	80-15-9			10	313	U096	
Cupferron	135-20-6				313		

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Cupric acetate	142-71-2			100	313c		
Cupric acetoarsenite	12002-03-8	500/10,000	1	1	313c		
Cupric chloride	7447-39-4			10	313c		
Cupric nitrate	3251-23-8			100	313c		
Cupric oxalate	5893-66-3			100	313c		
Cupric sulfate	7758-98-7			10	313c		
Cupric sulfate, ammoniated	10380-29-7			100	313c		
Cupric tartrate	815-82-7			100	313c		
Cyanazine	21725-46-2				313		
Cyanide Compounds	N106			***	313		
Cyanides (soluble salts and complexes)	57-12-5			10	313c	P030	
Cyanogen	460-19-5			100		P031	10,000
Cyanogen bromide	506-68-3	500/10,000	1,000	1,000	313c	U246	
Cyanogen chloride	506-77-4			10	313c	P033	10,000
Cyanogen chloride ((CN)Cl)	506-77-4			10	313c	P033	10,000
Cyanogen iodide	506-78-5	1,000/10,000	1,000		313c		
Cyanophos	2636-26-2	1,000	1,000				
Cyanuric fluoride	675-14-9	100	100		313c		
Cycloate	1134-23-2				313		
2,5-Cyclohexadiene-1,4-dione, 2,3,5-tris(1-aziridinyl)-	68-76-8				X		
Cyclohexanamine	108-91-8	10,000	10,000				15,000
Cyclohexane	110-82-7			1,000	313	U056	
1,4-Cyclohexane diisocyanate	2556-36-7				313#		
Cyclohexane, 1,2,3,4,5,6-hexachloro-,(1.alpha.,2.alpha.,3.beta.,4.alpha.,5.alpha.,6.beta.)-	58-89-9	1,000/10,000	1	1	X	U129	
Cyclohexanol	108-93-0				313		
Cyclohexanone	108-94-1			5,000		U057	
Cycloheximide	66-81-9	100/10,000	100				
Cyclohexylamine	108-91-8	10,000	10,000				15,000
2-Cyclohexyl-4,6-dinitrophenol	131-89-5			100		P034	
Cyclophosphamide	50-18-0			10		U058	
Cyclopropane	75-19-4						10,000
Cyfluthrin	68359-37-5				313		
Cyhalothrin	68085-85-8				313		
2,4-D	94-75-7			100	313	U240	
2,4-D Acid	94-75-7			100	X	U240	
2,4-D butyl ester	94-80-4			100	313		
2,4-D Esters	94-11-1			100	X		
2,4-D Esters	94-79-1			100			
2,4-D Esters	94-80-4			100	X		
2,4-D Esters	1320-18-9			100	X		
2,4-D Esters	1928-38-7			100			
2,4-D Esters	1928-61-6			100			
2,4-D Esters	1929-73-3			100	X		
2,4-D Esters	2971-38-2			100	X		
2,4-D Esters	25168-26-7			100			
2,4-D Esters	53467-11-1			100			
2,4-D isopropyl ester	94-11-1			100	313		
2,4-D propylene glycol butyl	1320-18-9			100	313		

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ether ester							
2,4-D, salts and esters	94-75-7			100		U240	
Daunomycin	20830-81-3			10		U059	
Dazomet	533-74-4				313		
Dazomet, sodium salt	53404-60-7				313		
2,4-DB	94-82-6				313		
DBCP	96-12-8			1	X	U066	
DDD	72-54-8			1		U060	
DDE	72-55-9			1			
DDE	3547-04-4			5,000			
DDT	50-29-3			1		U061	
DDT and Metabolites	0			***			
Decaborane(14)	17702-41-9	500/10,000	500				
Decabromodiphenyl oxide	1163-19-5				313		
DEF	78-48-8				X		
DEHP	117-81-7			100	X	U028	
Demeton	8065-48-3	500	500				
Demeton-S-methyl	919-86-8	500	500				
Desmedipham	13684-56-5				313		
2,4-D 2-ethylhexyl ester	1928-43-4				313		
2,4-D 2-ethyl-4-methylpentyl ester	53404-37-8				313		
Dialifor	10311-84-9	100/10,000	100				
Diallate	2303-16-4			100	313	U062	
2,4-Diaminoanisole	615-05-4				313		
2,4-Diaminoanisole sulfate	39156-41-7				313		
4,4'-Diaminodiphenyl ether	101-80-4				313		
Diaminotoluene	496-72-0			10		U221	
Diaminotoluene	823-40-5			10		U221	
2,4-Diaminotoluene	95-80-7			10	313		
Diaminotoluene (mixed isomers)	25376-45-8			10	313	U221	
o-Dianisidine dihydrochloride	20325-40-0				X		
o-Dianisidine hydrochloride	111984-09-9				X		
Diazinon	333-41-5			1	313		
Diazomethane	334-88-3			100	313		
Dibenz(a,h)acridine	226-36-8				313+^		
Dibenz(a,j)acridine	224-42-0				313+^		
Dibenz[a,h]anthracene	53-70-3			1	313+^	U063	
7H-Dibenzo(c,g)carbazole	194-59-2				313+^		
Dibenzo(a,e)fluoranthene	5385-75-1				313+^		
Dibenzofuran	132-64-9			100	313		
Dibenzo(a,e)pyrene	192-65-4				313+^		
Dibenzo(a,h)pyrene	189-64-0				313+^		
Dibenzo(a,l)pyrene	191-30-0				313+^		
Dibenz[a,i]pyrene	189-55-9			10	X	U064	
Diborane	19287-45-7	100	100				2,500
Diborane(6)	19287-45-7	100	100				2,500
1,2-Dibromo-3-chloropropane	96-12-8			1	313	U066	
1,2-Dibromoethane	106-93-4			1	313	U067	
3,5-Dibromo-4-hydroxybenzonitrile	1689-84-5				X		

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2,2-Dibromo-3-nitrilopropionamide	10222-01-2				313s		
Dibromotetrafluoroethane	124-73-2				313		
Dibutyl phthalate	84-74-2			10	313	U069	
Dicamba	1918-00-9			1,000	313		
Dichlobenil	1194-65-6			100			
Dichlone	117-80-6			1			
Dichloran	99-30-9				313		
Dichlorobenzene	25321-22-6			100	X		
o-Dichlorobenzene	95-50-1			100	X	U070	
1,2-Dichlorobenzene	95-50-1			100	313	U070	
1,3-Dichlorobenzene	541-73-1			100	313	U071	
1,4-Dichlorobenzene	106-46-7			100	313	U072	
Dichlorobenzene (mixed isomers)	25321-22-6			100	313		
3,3'-Dichlorobenzidine	91-94-1			1	313	U073	
Dichlorobenzidine	0			***			
3,3'-Dichlorobenzidine dihydrochloride	612-83-9				313		
3,3'-Dichlorobenzidine sulfate	64969-34-2				313		
Dichlorobromomethane	75-27-4			5,000	313		
trans-1,4-Dichloro-2-butene	110-57-6	500	500		313		
trans-1,4-Dichlorobutene	110-57-6	500	500		X		
1,4-Dichloro-2-butene	764-41-0			1	313	U074	
4,6-Dichloro-N-(2-chlorophenyl)-1,3,5-triazin-2-amine	101-05-3				X		
1,2-Dichloro-1,1-difluoroethane	1649-08-7				313		
Dichlorodifluoromethane	75-71-8			5,000	313	U075	
1,1-Dichloroethane	75-34-3			1,000	X	U076	
1,2-Dichloroethane	107-06-2			100	313	U077	
3-(2,2-Dichloroethenyl)-2,2-dimethylcyclopropane carboxylic acid, (3-phenoxy-phenyl)methyl ester	52645-53-1				X		
3-(2,2-Dichloroethenyl)-2,2-dimethylcyclopropanecarboxylic acid, cyano(4-fluoro-3-phenoxyphenyl)methyl ester	68359-37-5				X		
1,1-Dichloroethylene	75-35-4			100	X	U078	10,000
1,2-Dichloroethylene	156-60-5			1,000		U079	
1,2-Dichloroethylene	540-59-0				313		
Dichloroethyl ether	111-44-4	10,000	10	10	X	U025	
1,1-Dichloro-1-fluoroethane	1717-00-6				313		
Dichlorofluoromethane	75-43-4				313		
Dichloroisopropyl ether	108-60-1			1,000	X	U027	
Dichloromethane	75-09-2			1,000	313	U080	
3,6-Dichloro-2-methoxybenzoic acid	1918-00-9			1,000	X		
3,6-Dichloro-2-methoxybenzoic acid, sodium salt	1982-69-0				X		
Dichloromethyl ether	542-88-1	100	10	10	X	P016	1,000
3-(2,4-Dichloro-5-(1-methylethoxy)phenyl)-5-(1,1-	19666-30-9				X		

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
dimethylethyl)-1,3,4-oxadiazol-2(3H)-one							
Dichloromethylphenylsilane	149-74-6	1,000	1,000				
2,6-Dichloro-4-nitroaniline	99-30-9				X		
Dichloropentafluoropropane	127564-92-5				313		
2,2-Dichloro-1,1,1,3,3-pentafluoropropane	128903-21-9				313		
2,3-Dichloro-1,1,1,2,3-pentafluoropropane	422-48-0				313		
1,2-Dichloro-1,1,2,3,3-pentafluoropropane	422-44-6				313		
3,3-Dichloro-1,1,1,2,2-pentafluoropropane	422-56-0				313		
1,3-Dichloro-1,1,2,2,3-pentafluoropropane	507-55-1				313		
1,1-Dichloro-1,2,2,3,3-pentafluoropropane	13474-88-9				313		
1,2-Dichloro-1,1,3,3,3-pentafluoropropane	431-86-7				313		
1,3-Dichloro-1,1,2,3,3-pentafluoropropane	136013-79-1				313		
1,1-Dichloro-1,2,3,3,3-pentafluoropropane	111512-56-2				313		
Dichlorophene	97-23-4				313		
2,4-Dichlorophenol	120-83-2			100	313	U081	
2,6-Dichlorophenol	87-65-0			100		U082	
2-(4-(2,4-Dichlorophenoxy)phenoxy)propanoic acid, methyl ester	51338-27-3				X		
Dichlorophenylarsine	696-28-6	500	1	1		P036	
3-(3,5-Dichlorophenyl)-5-ethenyl-5-methyl-2,4-oxazolidinedione	50471-44-8				X		
2-(3,4-Dichlorophenyl)-4-methyl-1,2,4-oxadiazolidine-3,5-dione	20354-26-1				X		
N-(3,4-Dichlorophenyl)propanamide	709-98-8				X		
1-(2-(2,4-Dichlorophenyl)-2-(2-propenyloxy)ethyl)-1H-imidazole	35554-44-0				X		
1-(2-(2,4-Dichlorophenyl)-4-propyl-1,3-dioxolan-2-yl)-methyl-1H-1,2,4,-triazole	60207-90-1				X		
Dichloropropane	26638-19-7			1,000			
Dichloropropane - Dichloropropene (mixture)	8003-19-8			100			
1,1-Dichloropropane	78-99-9			1,000			
1,2-Dichloropropane	78-87-5			1,000	313	U083	
1,3-Dichloropropane	142-28-9			5,000			
Dichloropropene	26952-23-8			100			
1,3-Dichloropropene	542-75-6			100	X	U084	
trans-1,3-Dichloropropene	10061-02-6				313		
2,3-Dichloropropene	78-88-6			100	313		
2,2-Dichloropropionic acid	75-99-0			5,000			

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
1,3-Dichloropropylene	542-75-6			100	313	U084	
Dichlorosilane	4109-96-0						10,000
Dichlorotetrafluoroethane	76-14-2				313		
Dichloro-1,1,2-trifluoroethane	90454-18-5				313		
Dichlorotrifluoroethane	34077-87-7				313		
1,1-Dichloro-1,2,2-trifluoroethane	812-04-4				313		
1,2-Dichloro-1,1,2-trifluoroethane	354-23-4				313		
2,2-Dichloro-1,1,1-trifluoroethane	306-83-2				313		
Dichlorvos	62-73-7	1,000	10	10	313		
Diclofop methyl	51338-27-3				313		
Dicofol	115-32-2			10	313		
Dicrotophos	141-66-2	100	100				
Dicyclopentadiene	77-73-6				313		
Dieldrin	60-57-1			1		P037	
Diepoxybutane	1464-53-5	500	10	10	313	U085	
Diethanolamine	111-42-2			100	313		
Diethatyl ethyl	38727-55-8				313		
Diethylamine	109-89-7			100			
O-(2-(Diethylamino)-6-methyl-4-pyrimidinyl)-O,O-dimethyl phosphorothioate	29232-93-7				X		
N,N-Diethylaniline	91-66-7			1,000			
Diethylarsine	692-42-2			1		P038	
Diethyl chlorophosphate	814-49-3	500	500				
Diethyldiisocyanatobenzene	134190-37-7				313#		
Di(2-ethylhexyl) phthalate	117-81-7			100	313	U028	
O,O-Diethyl S-methyl dithiophosphate	3288-58-2			5,000		U087	
Diethyl-p-nitrophenyl phosphate	311-45-5			100		P041	
Diethyl phthalate	84-66-2			1,000		U088	
O,O-Diethyl O-pyrazinyl phosphorothioate	297-97-2	500	100	100		P040	
Diethylstilbestrol	56-53-1			1		U089	
Diethyl sulfate	64-67-5			10	313		
Diflubenzuron	35367-38-5				313		
Difluoroethane	75-37-6						10,000
Digitoxin	71-63-6	100/10,000	100				
Diglycidyl ether	2238-07-5	1,000	1,000				
Diglycidyl resorcinol ether	101-90-6				313		
Digoxin	20830-75-5	10/10,000	10				
2,3,-Dihydro-5,6-dimethyl-1,4-dithiin 1,1,4,4-tetraoxide	55290-64-7				X		
5,6-Dihydro-2-methyl-N-phenyl-1,4-oxathiin-3-carboxamide	5234-68-4				X		
Dihydrosafrole	94-58-6			10	313	U090	
Diisocyanates (includes only 20 chemicals)	N120				313		
4,4'-Diisocyanatodiphenyl ether	4128-73-8				313#		

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
2,4'-Diisocyanatodiphenyl sulfide	75790-87-3				313#		
Diisopropylfluorophosphate	55-91-4	100	100	100		P043	
Dimefox	115-26-4	500	500				
1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-(1.alpha.,4.alpha.,4a.beta.,5.alpha.,8.alpha.,8a.beta.)-	309-00-2	500/10,000	1	1	X	P004	
Dimethipin	55290-64-7				313		
Dimethoate	60-51-5	500/10,000	10	10	313	P044	
3,3'-Dimethoxybenzidine	119-90-4			100	313	U091	
3,3'-Dimethoxybenzidine dihydrochloride	20325-40-0				313		
3,3'-Dimethoxybenzidine-4,4'-diisocyanate	91-93-0				313#		
3,3'-Dimethoxybenzidine hydrochloride	111984-09-9				313		
Dimethylamine	124-40-3			1,000	313	U092	10,000
Dimethylamine dicamba	2300-66-5				313		
4-Dimethylaminoazobenzene	60-11-7			10	313	U093	
Dimethylaminoazobenzene	60-11-7			10	X	U093	
N,N-Dimethylaniline	121-69-7			100	313		
7,12-Dimethylbenz[a]anthracene	57-97-6			1	313+^	U094	
3,3'-Dimethylbenzidine	119-93-7			10	313	U095	
3,3'-Dimethylbenzidine dihydrochloride	612-82-8				313		
3,3'-Dimethylbenzidine dihydrofluoride	41766-75-0				313		
2,2-Dimethyl-1,3-benzodioxol-4-ol methylcarbamate	22781-23-3			1*	X	U278	
Dimethylcarbamyl chloride	79-44-7			1	313	U097	
Dimethyl chlorothiophosphate	2524-03-0	500	500		313		
Dimethyldichlorosilane	75-78-5	500	500				5,000
3,3'-Dimethyl-4,4'-diphenylene diisocyanate	91-97-4				313#		
3,3'-Dimethyldiphenylmethane-4,4'-diisocyanate	139-25-3				313#		
N-(5-(1,1-Dimethylethyl)-1,3,4-thiadiazol-2-yl)-N,N'-dimethylurea	34014-18-1				X		
Dimethylformamide	68-12-2			100	X		
N,N-Dimethylformamide	68-12-2			100	313		
1,1-Dimethyl hydrazine	57-14-7	1,000	10	10	313	U098	15,000
Dimethylhydrazine	57-14-7	1,000	10	10	X	U098	15,000
O,O-Dimethyl O-(3-methyl-4-(methylthio) phenyl) ester, phosphorothioic acid	55-38-9				X		
2,2-Dimethyl-3-(2-methyl-1-propenyl)cyclopropanecarboxylic acid (1,3,4,5,6,7-hexahydro-1,3-dioxo-2H-isoindol-2-yl)methyl ester	7696-12-0				X		

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
2,2-Dimethyl-3-(2-methyl-1-propenyl)cyclopropanecarboxylic acid (3-phenoxyphenyl)methyl ester	26002-80-2				X		
2,4-Dimethylphenol	105-67-9			100	313	U101	
Dimethyl-p-phenylenediamine	99-98-9	10/10,000	10				
Dimethyl phosphorochloridothioate	2524-03-0	500	500		X		
Dimethyl phthalate	131-11-3			5,000	313	U102	
2,2-Dimethylpropane	463-82-1						10,000
Dimethyl sulfate	77-78-1	500	100	100	313	U103	
O,O-Dimethyl-O-(3,5,6-trichloro-2-pyridyl)phosphorothioate	5598-13-0				X		
Dimetilan	644-64-4	500/10,000	1*	1*		P191	
Dinitrobenzene (mixed isomers)	25154-54-5			100			
m-Dinitrobenzene	99-65-0			100	313		
o-Dinitrobenzene	528-29-0			100	313		
p-Dinitrobenzene	100-25-4			100	313		
Dinitrobutyl phenol	88-85-7	100/10,000	1,000	1,000	313	P020	
4,6-Dinitro-o-cresol	534-52-1	10/10,000	10	10	313	P047	
Dinitrocresol	534-52-1	10/10,000	10	10	X	P047	
4,6-Dinitro-o-cresol and salts	534-52-1			10		P047	
Dinitrophenol	25550-58-7			10			
2,4-Dinitrophenol	51-28-5			10	313	P048	
2,5-Dinitrophenol	329-71-5			10			
2,6-Dinitrophenol	573-56-8			10			
Dinitrotoluene (mixed isomers)	25321-14-6			10	313		
2,4-Dinitrotoluene	121-14-2			10	313	U105	
2,6-Dinitrotoluene	606-20-2			100	313	U106	
3,4-Dinitrotoluene	610-39-9			10			
Dinocap	39300-45-3				313		
Dinoseb	88-85-7	100/10,000	1,000	1,000	X	P020	
Dinoterb	1420-07-1	500/10,000	500				
Di-n-octyl phthalate	117-84-0			5,000		U107	
n-Dioctylphthalate	117-84-0			5,000		U107	
1,4-Dioxane	123-91-1			100	313	U108	
Dioxathion	78-34-2	500	500				
Dioxin and dioxin-like compounds (includes only 17 chemicals)	N150				313^		
Diphacinone	82-66-6	10/10,000	10				
Diphenamid	957-51-7				313		
Diphenylamine	122-39-4				313		
1,2-Diphenylhydrazine	122-66-7			10	313	U109	
Diphenylhydrazine	0			***			
Diphosphoramide, octamethyl-	152-16-9	100	100	100		P085	
Dipotassium endothall	2164-07-0				313		
Dipropylamine	142-84-7			5,000		U110	
4-(Dipropylamino)-3,5-dinitrobenzenesulfonamide	19044-88-3				X		
Dipropyl isocinchomeronate	136-45-8				313		

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Di-n-propylnitrosamine	621-64-7			10	X	U111	
Diquat	85-00-7			1,000			
Diquat	2764-72-9			1,000			
Disodium cyanodithioimidocarbonate	138-93-2				313		
Disulfoton	298-04-4	500	1	1		P039	
Dithiazanine iodide	514-73-8	500/10,000	500				
Dithiobiuret	541-53-7	100/10,000	100	100	X	P049	
2,4-Dithiobiuret	541-53-7	100/10,000	100	100	313	P049	
Diuron	330-54-1			100	313		
Dodecylbenzenesulfonic acid	27176-87-0			1,000			
Dodecylguanidine monoacetate	2439-10-3				X		
Dodine	2439-10-3				313		
2,4-DP	120-36-5				313		
2,4-D sodium salt	2702-72-9				313		
Emetine, dihydrochloride	316-42-7	1/10,000	1				
alpha - Endosulfan	959-98-8			1			
beta - Endosulfan	33213-65-9			1			
Endosulfan	115-29-7	10/10,000	1	1		P050	
Endosulfan and Metabolites	0			***			
Endosulfan sulfate	1031-07-8			1			
Endothall	145-73-3			1,000		P088	
Endothion	2778-04-3	500/10,000	500				
Endrin	72-20-8	500/10,000	1	1		P051	
Endrin aldehyde	7421-93-4			1			
Endrin and Metabolites	0			***			
Epichlorohydrin	106-89-8	1,000	100	100	313	U041	20,000
Epinephrine	51-43-4			1,000		P042	
EPN	2104-64-5	100/10,000	100				
EPTC	759-94-4				X		
Ergocalciferol	50-14-6	1,000/10,000	1,000				
Ergotamine tartrate	379-79-3	500/10,000	500				
Ethanamine	75-04-7			100			10,000
Ethane	74-84-0						10,000
Ethane, chloro-	75-00-3			100	X		10,000
1,2-Ethanediamine	107-15-3	10,000	5,000	5,000			20,000
Ethane, 1,1-difluoro-	75-37-6						10,000
Ethanedinitrile	460-19-5			100		P031	10,000
Ethane, 1,1'-oxybis-	60-29-7			100		U117	10,000
Ethaneperoxoic acid	79-21-0	500	500		X		10,000
Ethanesulfonyl chloride, 2-chloro-	1622-32-8	500	500				
Ethane, 1,1,1,2-tetrachloro-	630-20-6			100	X	U208	
Ethane, 1,1'-thiobis[2-chloro-	505-60-2	500	500		X		
Ethanethiol	75-08-1						10,000
Ethane, 1,1,2-trichloro-1,2,2,-trifluoro-	76-13-1				X		
Ethanimidothioic acid, 2-(dimethylamino)-N-hydroxy-2-oxo-, methyl ester	30558-43-1			1*		U394	
Ethanimidothioic acid, N-[[methylamino)carbonyl]	16752-77-5	500/10,000	100	100		P066	

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Ethanol, 1,2-dichloro-, acetate	10140-87-1	1,000	1,000				
Ethanol, 2-ethoxy-	110-80-5			1,000	X	U359	
Ethanol, 2,2'-oxybis-, dicarbamate	5952-26-1			1*		U395	
Ethene	74-85-1				X		10,000
Ethene, bromotrifluoro-	598-73-2						10,000
Ethene, chloro-	75-01-4			1	X	U043	10,000
Ethene, chlorotrifluoro-	79-38-9						10,000
Ethene, 1,1-dichloro-	75-35-4			100	X	U078	10,000
Ethene, 1,1-difluoro-	75-38-7						10,000
Ethene, ethoxy-	109-92-2						10,000
Ethene, fluoro-	75-02-5						10,000
Ethene, methoxy-	107-25-5						10,000
Ethene, tetrafluoro-	116-14-3						10,000
Ethion	563-12-2	1,000	10	10			
Ethoprop	13194-48-4	1,000	1,000		313		
Ethoprophos	13194-48-4	1,000	1,000		X		
2-Ethoxyethanol	110-80-5			1,000	313	U359	
2-(1-(Ethoxyimino) butyl)-5-(2-(ethylthio)propyl)-3-hydroxyl-2-cyclohexen-1-one	74051-80-2				X		
2-((Ethoxyl((1-methylethyl)amino]phosphinothioyl]oxy) benzoic acid 1-methylethyl ester	25311-71-1				X		
Ethyl acetate	141-78-6			5,000		U112	
Ethyl acetylene	107-00-6						10,000
Ethyl acrylate	140-88-5			1,000	313	U113	
3-((Ethylamino)methoxyphosphinothioyl)oxy)-2-butenoic acid, 1-methylethyl ester	31218-83-4				X		
Ethylbenzene	100-41-4			1,000	313		
Ethylbis(2-chloroethyl)amine	538-07-8	500	500				
Ethyl carbamate	51-79-6			100	X	U238	
Ethyl chloride	75-00-3			100	X		10,000
Ethyl chloroformate	541-41-3				313		
Ethyl-2-(((((4-chloro-6-methoxyprimidin-2-yl)amino)carbonyl)amino)sulfonyl)benzoate	90982-32-4				X		
Ethyl cyanide	107-12-0	500	10	10		P101	10,000
Ethyl dipropylthiocarbamate	759-94-4				313		
Ethylene	74-85-1				313		10,000
Ethylenebisdithiocarbamic acid, salts and esters	N171				313		
Ethylenebisdithiocarbamic acid, salts & esters	111-54-6			5,000	X	U114	
Ethylenediamine	107-15-3	10,000	5,000	5,000			20,000
Ethylenediamine-tetraacetic acid (EDTA)	60-00-4			5,000			
Ethylene dibromide	106-93-4			1	X	U067	
Ethylene dichloride	107-06-2			100	X	U077	
Ethylene fluorohydrin	371-62-0	10	10				

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Ethylene glycol	107-21-1			5,000	313		
Ethyleneimine	151-56-4	500	1	1	313	P054	10,000
Ethylene oxide	75-21-8	1,000	10	10	313	U115	10,000
Ethylene thiourea	96-45-7			10	313	U116	
Ethyl ether	60-29-7			100		U117	10,000
Ethylidene Dichloride	75-34-3			1,000	313	U076	
Ethyl mercaptan	75-08-1						10,000
Ethyl methacrylate	97-63-2			1,000		U118	
Ethyl methanesulfonate	62-50-0			1		U119	
N-Ethyl-N'-(1-methylethyl)-6-(methylthio)-1,3,5,-triazine-2,4-diamine	834-12-8				X		
O-Ethyl O-(4-(methylthio)phenyl)phosphorodithioic acid S-propyl ester	35400-43-2				X		
Ethyl nitrite	109-95-5						10,000
N-(1-Ethylpropyl)-3,4-dimethyl-2,6-dinitrobenzenamine	40487-42-1				X		
S-(2-(Ethylsulfinyl)ethyl) O,O-dimethyl ester phosphorothioic acid	301-12-2				X		
Ethylthiocyanate	542-90-5	10,000	10,000				
Ethyne	74-86-2						10,000
Famphur	52-85-7			1,000	313	P097	
Fenamiphos	22224-92-6	10/10,000	10				
Fenarimol	60168-88-9				313		
Fenbutatin oxide	13356-08-6				313		
Fenoxaprop ethyl	66441-23-4				313		
Fenoxycarb	72490-01-8				313		
Fenpropathrin	39515-41-8				313		
Fensulfothion	115-90-2	500	500				
Fenthion	55-38-9				313		
Fenvalerate	51630-58-1				313		
Ferbam	14484-64-1				313		
Ferric ammonium citrate	1185-57-5			1,000			
Ferric ammonium oxalate	2944-67-4			1,000			
Ferric ammonium oxalate	55488-87-4			1,000			
Ferric chloride	7705-08-0			1,000			
Ferric fluoride	7783-50-8			100			
Ferric nitrate	10421-48-4			1,000			
Ferric sulfate	10028-22-5			1,000			
Ferrous ammonium sulfate	10045-89-3			1,000			
Ferrous chloride	7758-94-3			100			
Ferrous sulfate	7720-78-7			1,000			
Ferrous sulfate	7782-63-0			1,000			
Fine mineral fibers	0			***			
Fluazifop butyl	69806-50-4				313		
Fluenetil	4301-50-2	100/10,000	100				
Fluometuron	2164-17-2				313		
Fluoranthene	206-44-0			100	X	U120	
Fluorene	86-73-7			5,000			
Fluorine	7782-41-4	500	10	10	313	P056	1,000
Fluoroacetamide	640-19-7	100/10,000	100	100		P057	

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Fluoroacetic acid	144-49-0	10/10,000	10				
Fluoroacetic acid, sodium salt	62-74-8	10/10,000	10	10	X	P058	
Fluoroacetyl chloride	359-06-8	10	10				
Fluorouracil	51-21-8	500/10,000	500		313		
5-Fluorouracil	51-21-8	500/10,000	500		X		
Fluvalinate	69409-94-5				313		
Folpet	133-07-3				313		
Fomesafen	72178-02-0				313		
Fonofos	944-22-9	500	500				
Formaldehyde	50-00-0	500	100	100	313	U122	15,000
Formaldehyde cyanohydrin	107-16-4	1,000	1,000				
Formaldehyde (solution)	50-00-0	500	100	100	X	U122	15,000
Formetanate hydrochloride	23422-53-9	500/10,000	1*	1*		P198	
Formic acid	64-18-6			5,000	313	U123	
Formic acid, methyl ester	107-31-3						10,000
Formothion	2540-82-1	100	100				
Formparanate	17702-57-7	100/10,000	1*	1*		P197	
Fosthietan	21548-32-3	500	500				
Freon 113	76-13-1				313		
Fuberidazole	3878-19-1	100/10,000	100				
Fumaric acid	110-17-8			5,000			
Furan	110-00-9	500	100	100		U124	5,000
Furan, tetrahydro-	109-99-9			1,000		U213	
Furfural	98-01-1			5,000		U125	
Gallium trichloride	13450-90-3	500/10,000	500				
Glycidylaldehyde	765-34-4			10		U126	
Glycol Ethers	N230			***	313		
Guanidine, N-methyl-N'-nitro-N-nitroso-	70-25-7			10		U163	
Guthion	86-50-0	10/10,000	1	1			
Haloethers	0			***			
Halomethanes	0			***			
Halon 1211	353-59-3				X		
Halon 1301	75-63-8				X		
Halon 2402	124-73-2				X		
HCFC-121	354-14-3				X		
HCFC-121a	354-11-0				X		
HCFC-123	306-83-2				X		
HCFC-123a	354-23-4				X		
HCFC-123b	812-04-4				X		
HCFC-124	2837-89-0				X		
HCFC-124a	354-25-6				X		
HCFC-132b	1649-08-7				X		
HCFC-133a	75-88-7				X		
HCFC-141b	1717-00-6				X		
HCFC-142b	75-68-3				X		
HCFC-21	75-43-4				X		
HCFC-22	75-45-6				X		
HCFC-225aa	128903-21-9				X		
HCFC-225ba	422-48-0				X		
HCFC-225bb	422-44-6				X		
HCFC-225ca	422-56-0				X		

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
HCFC-225cb	507-55-1				X		
HCFC-225cc	13474-88-9				X		
HCFC-225da	431-86-7				X		
HCFC-225ea	136013-79-1				X		
HCFC-225eb	111512-56-2				X		
HCFC-253fb	460-35-5				X		
Heptachlor	76-44-8			1	313^	P059	
Heptachlor and Metabolites	0			***			
Heptachlor epoxide	1024-57-3			1			
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	35822-46-9				313!^		
1,2,3,4,6,7,8-heptachlorodibenzofuran	67562-39-4				313!^		
1,2,3,4,7,8,9-heptachlorodibenzofuran	55673-89-7				313!^		
1,4,5,6,7,8,8-Heptachloro-3a,4,7,7a-tetrahydro-4,7-methano-1H-indene	76-44-8			1	X	P059	
Hexachlorobenzene	118-74-1			10	313^	U127	
Hexachloro-1,3-butadiene	87-68-3			1	313	U128	
Hexachlorobutadiene	87-68-3			1	X	U128	
Hexachlorocyclohexane (all isomers)	608-73-1			***			
alpha-Hexachlorocyclohexane	319-84-6			10	313		
Hexachlorocyclohexane (gamma isomer)	58-89-9	1,000/10,000	1	1	X	U129	
Hexachlorocyclopentadiene	77-47-4	100	10	10	313	U130	
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin	39227-28-6				313!^		
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin	57653-85-7				313!^		
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin	19408-74-3				313!^		
1,2,3,4,7,8-hexachlorodibenzofuran	70648-26-9				313!^		
1,2,3,6,7,8-hexachlorodibenzofuran	57117-44-9				313!^		
1,2,3,7,8,9-hexachlorodibenzofuran	72918-21-9				313!^		
2,3,4,6,7,8-hexachlorodibenzofuran	60851-34-5				313!^		
Hexachloroethane	67-72-1			100	313	U131	
Hexachloronaphthalene	1335-87-1				313		
Hexachlorophene	70-30-4			100	313	U132	
Hexachloropropene	1888-71-7			1,000		U243	
Hexaethyl tetraphosphate	757-58-4			100		P062	
Hexakis(2-methyl-2-phenylpropyl)distannoxane	13356-08-6				X		
Hexamethylenediamine, N,N'-dibutyl-	4835-11-4	500	500				
Hexamethylene-1,6-diisocyanate	822-06-0			100	313#		
Hexamethylphosphoramide	680-31-9			1	313		
Hexane	110-54-3			5,000	X		
n-Hexane	110-54-3			5,000	313		

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Hexazinone	51235-04-2				313		
Hydramethylnon	67485-29-4				313		
Hydrazine	302-01-2	1,000	1	1	313	U133	15,000
Hydrazine, 1,2-diethyl-	1615-80-1			10		U086	
Hydrazine, 1,1-dimethyl-	57-14-7	1,000	10	10	X	U098	15,000
Hydrazine, 1,2-dimethyl-	540-73-8			1		U099	
Hydrazine, 1,2-diphenyl-	122-66-7			10	X	U109	
Hydrazine, methyl-	60-34-4	500	10	10	X	P068	15,000
Hydrazine sulfate	10034-93-2				313		
Hydrazobenzene	122-66-7			10	X	U109	
Hydrochloric acid	7647-01-0			5,000			
Hydrochloric acid (conc 37% or greater)	7647-01-0			5,000			15,000
Hydrochloric acid (aerosol forms only)	7647-01-0			5,000	313		
Hydrocyanic acid	74-90-8	100	10	10	X	P063	2,500
Hydrofluoric acid	7664-39-3	100	100	100	X	U134	
Hydrofluoric acid (conc. 50% or greater)	7664-39-3	100	100	100	X	U134	1,000
Hydrogen	1333-74-0						10,000
Hydrogen chloride (anhydrous)	7647-01-0	500	5,000	5,000	X		5,000
Hydrogen chloride (gas only)	7647-01-0	500	5,000	5,000	X		5,000
Hydrogen cyanide	74-90-8	100	10	10	313	P063	2,500
Hydrogen fluoride	7664-39-3	100	100	100	313	U134	
Hydrogen fluoride (anhydrous)	7664-39-3	100	100	100	X	U134	1,000
Hydrogen peroxide (Conc.> 52%)	7722-84-1	1,000	1,000				
Hydrogen selenide	7783-07-5	10	10		313c		500
Hydrogen sulfide	7783-06-4	500	100	100	313s	U135	10,000
Hydroperoxide, 1-methyl-1-phenylethyl-	80-15-9			10	X	U096	
Hydroquinone	123-31-9	500/10,000	100	100	313		
Imazalil	35554-44-0				313		
Indeno(1,2,3-cd)pyrene	193-39-5			100	313+^	U137	
3-Iodo-2-propynyl butylcarbamate	55406-53-6				313		
Iron carbonyl (Fe(CO)5), (TB-5-11)-	13463-40-6	100	100		X		2,500
Iron, pentacarbonyl-	13463-40-6	100	100		313		2,500
Isobenzan	297-78-9	100/10,000	100				
Isobutane	75-28-5						10,000
Isobutyl alcohol	78-83-1			5,000		U140	
Isobutyraldehyde	78-84-2				313		
Isobutyronitrile	78-82-0	1,000	1,000				20,000
Isocyanic acid, 3,4-dichlorophenyl ester	102-36-3	500/10,000	500				
Isodrin	465-73-6	100/10,000	1	1	313^	P060	
Isofenphos	25311-71-1				313		
Isofluorphate	55-91-4	100	100	100		P043	
1H-Isoindole-1,3(2H)-dione, 3a,4,7,7a-tetrahydro-2-[(trichloromethyl)thio]-	133-06-2			10	X		
Isopentane	78-78-4						10,000
Isophorone	78-59-1			5,000			

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Isophorone diisocyanate	4098-71-9	100	100		313#		
Isoprene	78-79-5			100			10,000
Isopropanolamine dodecylbenzene sulfonate	42504-46-1			1,000			
Isopropyl alcohol (mfg-strong acid process)	67-63-0				313		
Isopropylamine	75-31-0						10,000
Isopropyl chloride	75-29-6						10,000
Isopropyl chloroformate	108-23-6	1,000	1,000				15,000
4,4'-Isopropylidenediphenol	80-05-7				313		
Isopropylmethylpyrazolyl dimethylcarbamate	119-38-0	500	1*	1*		P192	
Isosafrole	120-58-1			100	313	U141	
Isothiocyanatomethane	556-61-6	500	500		X		
Kepone	143-50-0			1		U142	
Lactofen	77501-63-4				313		
Lactonitrile	78-97-7	1,000	1,000				
Lasiocarpine	303-34-4			10		U143	
Lead	7439-92-1			10	313^		
Lead acetate	301-04-2			10	313c	U144	
Lead arsenate	7645-25-2			1	313c		
Lead arsenate	7784-40-9			1	313c		
Lead arsenate	10102-48-4			1	313c		
Lead chloride	7758-95-4			10	313c		
Lead Compounds	N420			***	313^		
Lead fluoborate	13814-96-5			10	313c		
Lead fluoride	7783-46-2			10	313c		
Lead iodide	10101-63-0			10	313c		
Lead nitrate	10099-74-8			10	313c		
Lead phosphate	7446-27-7			10	313c	U145	
Lead stearate	1072-35-1			10	313c		
Lead stearate	7428-48-0			10	313c		
Lead stearate	52652-59-2			10	313c		
Lead stearate	56189-09-4			10	313c		
Lead subacetate	1335-32-6			10	313c	U146	
Lead sulfate	7446-14-2			10	313c		
Lead sulfate	15739-80-7			10	313c		
Lead sulfide	1314-87-0			10	313c		
Lead thiocyanate	592-87-0			10	313c		
Leptophos	21609-90-5	500/10,000	500				
Lewisite	541-25-3	10	10				
Lindane	58-89-9	1,000/10,000	1	1	313	U129	
Linuron	330-55-2				313		
Lithium carbonate	554-13-2				313		
Lithium chromate	14307-35-8			10	313c		
Lithium hydride	7580-67-8	100	100				
Malathion	121-75-5			100	313		
Maleic acid	110-16-7			5,000			
Maleic anhydride	108-31-6			5,000	313	U147	
Maleic hydrazide	123-33-1			5,000		U148	
Malononitrile	109-77-3	500/10,000	1,000	1,000	313	U149	
Maneb	12427-38-2				313		

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Manganese	7439-96-5				313		
Manganese, bis(dimethylcarbamodithioato-S,S')-	15339-36-3			1*	313c	P196	
Manganese Compounds	N450			***	313		
Manganese, tricarbonyl methylcyclopentadienyl	12108-13-3	100	100		313c		
MBOCA	101-14-4			10	X	U158	
MBT	149-30-4				X		
MCPA	94-74-6				X		
MDI	101-68-8			5,000	X		
Mechlorethamine	51-75-2	10	10		X		
Mecoprop	93-65-2				313		
Melphalan	148-82-3			1		U150	
Mephosfolan	950-10-7	500	500				
2-Mercaptobenzothiazole	149-30-4				313		
Mercaptodimethur	2032-65-7	500/10,000	10	10	X	P199	
Mercuric acetate	1600-27-7	500/10,000	500		313c		
Mercuric chloride	7487-94-7	500/10,000	500		313c		
Mercuric cyanide	592-04-1			1	313c		
Mercuric nitrate	10045-94-0			10	313c		
Mercuric oxide	21908-53-2	500/10,000	500		313c		
Mercuric sulfate	7783-35-9			10	313c		
Mercuric thiocyanate	592-85-8			10	313c		
Mercurous nitrate	7782-86-7			10	313c		
Mercurous nitrate	10415-75-5			10	313c		
Mercury	7439-97-6			1	313^	U151	
Mercury Compounds	N458			***	313^		
Mercury fulminate	628-86-4			10	313c	P065	
Merphos	150-50-5				313		
Methacrolein diacetate	10476-95-6	1,000	1,000				
Methacrylic anhydride	760-93-0	500	500				
Methacrylonitrile	126-98-7	500	1,000	1,000	313	U152	10,000
Methacryloyl chloride	920-46-7	100	100				
Methacryloyloxyethyl isocyanate	30674-80-7	100	100				
Methamidophos	10265-92-6	100/10,000	100				
Metham sodium	137-42-8				313		
Methanamine	74-89-5			100			10,000
Methanamine, N,N-dimethyl-	75-50-3			100			10,000
Methanamine, N-methyl-	124-40-3			1,000	X	U092	10,000
Methanamine, N-methyl-N-nitroso-	62-75-9	1,000	10	10	X	P082	
Methane	74-82-8						10,000
Methane, chloro-	74-87-3			100	X	U045	10,000
Methane, chloromethoxy-	107-30-2	100	10	10	X	U046	5,000
Methane, isocyanato-	624-83-9	500	10	10	X	P064	10,000
Methane, oxybis-	115-10-6						10,000
Methane, oxybis[chloro-	542-88-1	100	10	10	X	P016	1,000
Methanesulfenyl chloride, trichloro-	594-42-3	500	100	100	X		10,000
Methanesulfonyl fluoride	558-25-8	1,000	1,000				
Methane, tetranitro-	509-14-8	500	10	10		P112	10,000

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Methanethiol	74-93-1	500	100	100	X	U153	10,000
Methane, trichloro-	67-66-3	10,000	10	10	X	U044	20,000
4,7-Methanoindan, 1,2,3,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-	57-74-9	1,000	1	1	X	U036	
Methanol	67-56-1			5,000	313	U154	
Methapyrilene	91-80-5			5,000		U155	
Methazole	20354-26-1				313		
Methidathion	950-37-8	500/10,000	500				
Methiocarb	2032-65-7	500/10,000	10	10	313	P199	
Methomyl	16752-77-5	500/10,000	100	100		P066	
Methoxone	94-74-6				313		
Methoxone sodium salt	3653-48-3				313		
Methoxychlor	72-43-5			1	313^	U247	
2-Methoxyethanol	109-86-4				313		
Methoxyethylmercuric acetate	151-38-2	500/10,000	500		313c		
2-(4-Methoxy-6-methyl-1,3,5-triazin-2-yl)-methylamino)carbonyl)amino)sulfonyl)benzoic acid, methyl ester	101200-48-0				X		
Methyl acrylate	96-33-3				313		
Methyl bromide	74-83-9	1,000	1,000	1,000	X	U029	
2-Methyl-1-butene	563-46-2						10,000
3-Methyl-1-butene	563-45-1						10,000
Methyl chloride	74-87-3			100	X	U045	10,000
Methyl 2-chloroacrylate	80-63-7	500	500				
Methyl chlorocarbonate	79-22-1	500	1,000	1,000	313	U156	5,000
Methyl chloroform	71-55-6			1,000	X	U226	
Methyl chloroformate	79-22-1	500	1,000	1,000	X	U156	5,000
3-Methylcholanthrene	56-49-5			10	313+^	U157	
5-Methylchrysene	3697-24-3				313+^		
4-Methyldiphenylmethane-3,4-diisocyanate	75790-84-0				313#		
6-Methyl-1,3-dithiolo[4,5-b]quinoxalin-2-one	2439-01-2				X		
4,4'-Methylenebis(2-chloroaniline)	101-14-4			10	313	U158	
2,2'-Methylenebis(4-chlorophenol	97-23-4				X		
4,4'-Methylenebis(N,N-dimethyl)benzenamine	101-61-1				313		
1,1'-Methylene bis(4-isocyanatocyclohexane)	5124-30-1				313#		
Methylenebis(phenylisocyanate)	101-68-8			5,000	313#		
Methylene bromide	74-95-3			1,000	313	U068	
Methylene chloride	75-09-2			1,000	X	U080	
4,4'-Methylenedianiline	101-77-9			10	313		
Methyl ether	115-10-6						10,000
Methyl ethyl ketone	78-93-3			5,000	313	U159	
Methyl ethyl ketone (MEK)	78-93-3			5,000	X	U159	
Methyl ethyl ketone peroxide	1338-23-4			10		U160	
Methyl formate	107-31-3						10,000

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Methyl hydrazine	60-34-4	500	10	10	313	P068	15,000
Methyl iodide	74-88-4			100	313	U138	
Methyl isobutyl ketone	108-10-1			5,000	313	U161	
Methyl isocyanate	624-83-9	500	10	10	313	P064	10,000
Methyl isothiocyanate	556-61-6	500	500		313		
2-Methyllactonitrile	75-86-5	1,000	10	10	313	P069	
Methyl mercaptan	74-93-1	500	100	100	313s	U153	10,000
Methylmercuric dicyanamide	502-39-6	500/10,000	500		313c		
Methyl methacrylate	80-62-6			1,000	313	U162	
N-Methylolacrylamide	924-42-5				313		
Methyl parathion	298-00-0	100/10,000	100	100	313	P071	
Methyl phenkapton	3735-23-7	500	500				
Methyl phosphonic dichloride	676-97-1	100	100				
2-Methylpropene	115-11-7						10,000
2-Methylpyridine	109-06-8			5,000	313	U191	
N-Methyl-2-pyrrolidone	872-50-4				313		
Methyl tert-butyl ether	1634-04-4			1,000	313		
Methyl thiocyanate	556-64-9	10,000	10,000				20,000
Methylthiouracil	56-04-2			10		U164	
Methyltrichlorosilane	75-79-6	500	500				5,000
Methyl vinyl ketone	78-94-4	10	10				
Metiram	9006-42-2				313		
Metolcarb	1129-41-5	100/10,000	1*	1*		P190	
Metribuzin	21087-64-9				313		
Mevinphos	7786-34-7	500	10	10	313		
Mexacarbate	315-18-4	500/10,000	1,000	1,000		P128	
Michler's ketone	90-94-8				313		
Mitomycin C	50-07-7	500/10,000	10	10		U010	
Molinate	2212-67-1				313		
Molybdenum trioxide	1313-27-5				313		
Monochloropentafluoroethane	76-15-3				313		
Monocrotophos	6923-22-4	10/10,000	10				
Monoethylamine	75-04-7			100			10,000
Monomethylamine	74-89-5			100			10,000
Monuron	150-68-5				313		
Muscimol	2763-96-4	500/10,000	1,000	1,000		P007	
Mustard gas	505-60-2	500	500		313		
Myclobutanil	88671-89-0				313		
Nabam	142-59-6				313		
Naled	300-76-5			10	313		
Naphthalene	91-20-3			100	313	U165	
1,5-Naphthalene diisocyanate	3173-72-6				313#		
1-Naphthalenol, methylcarbamate	63-25-2			100	X	U279	
Naphthenic acid	1338-24-5			100			
1,4-Naphthoquinone	130-15-4			5,000		U166	
alpha-Naphthylamine	134-32-7			100	313	U167	
beta-Naphthylamine	91-59-8			10	313	U168	
Nickel	7440-02-0			100	313		
Nickel ammonium sulfate	15699-18-0			100	313c		
Nickel carbonyl	13463-39-3	1	10	10	313c	P073	1,000
Nickel chloride	7718-54-9			100	313c		

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Nickel chloride	37211-05-5			100	313c		
Nickel Compounds	N495			***	313		
Nickel cyanide	557-19-7			10	313c	P074	
Nickel hydroxide	12054-48-7			10	313c		
Nickel nitrate	14216-75-2			100	313c		
Nickel sulfate	7786-81-4			100	313c		
Nicotine	54-11-5	100	100	100	313c	P075	
Nicotine and salts	54-11-5			100	313c	P075	
Nicotine and salts	N503				313		
Nicotine sulfate	65-30-5	100/10,000	100	100	313c		
Nitrapyrin	1929-82-4				313		
Nitrate compounds (water dissociable)	N511				313		
Nitric acid	7697-37-2	1,000	1,000	1,000	313		
Nitric acid (conc 80% or greater)	7697-37-2	1,000	1,000	1,000	X		15,000
Nitric oxide	10102-43-9	100	10	10		P076	10,000
Nitrilotriacetic acid	139-13-9				313		
p-Nitroaniline	100-01-6			5,000	313	P077	
5-Nitro-o-anisidine	99-59-2				313		
Nitrobenzene	98-95-3	10,000	1,000	1,000	313	U169	
4-Nitrobiphenyl	92-93-3			10	313		
Nitrocyclohexane	1122-60-7	500	500				
Nitrofen	1836-75-5				313		
Nitrogen dioxide	10102-44-0	100	10	10		P078	
Nitrogen dioxide	10544-72-6			10			
Nitrogen mustard	51-75-2	10	10		313		
Nitrogen oxide (NO)	10102-43-9	100	10	10		P076	10,000
Nitroglycerin	55-63-0			10	313	P081	
Nitrophenol (mixed isomers)	25154-55-6			100			
2-Nitrophenol	88-75-5			100	313		
4-Nitrophenol	100-02-7			100	313	U170	
m-Nitrophenol	554-84-7			100			
p-Nitrophenol	100-02-7			100	X	U170	
Nitrophenols	0			***			
2-Nitropropane	79-46-9			10	313	U171	
1-Nitropyrene	5522-43-0				313+^		
Nitrosamines	0			***			
N-Nitrosodi-n-butylamine	924-16-3			10	313	U172	
N-Nitrosodiethanolamine	1116-54-7			1		U173	
N-Nitrosodiethylamine	55-18-5			1	313	U174	
N-Nitrosodimethylamine	62-75-9	1,000	10	10	313	P082	
Nitrosodimethylamine	62-75-9	1,000	10	10	X	P082	
N-Nitrosodiphenylamine	86-30-6			100	313		
p-Nitrosodiphenylamine	156-10-5				313		
N-Nitrosodi-n-propylamine	621-64-7			10	313	U111	
N-Nitroso-N-ethylurea	759-73-9			1	313	U176	
N-Nitroso-N-methylurea	684-93-5			1	313	U177	
N-Nitroso-N-methylurethane	615-53-2			1		U178	
N-Nitrosomethylvinylamine	4549-40-0			10	313	P084	
N-Nitrosomorpholine	59-89-2			1	313		
N-Nitrosonornicotine	16543-55-8				313		

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
N-Nitrosopiperidine	100-75-4			10	313	U179	
N-Nitrosopyrrolidine	930-55-2			1		U180	
Nitrotoluene	1321-12-6			1,000			
m-Nitrotoluene	99-08-1			1,000			
o-Nitrotoluene	88-72-2			1,000			
p-Nitrotoluene	99-99-0			1,000			
5-Nitro-o-toluidine	99-55-8			100	313	U181	
Nitrous acid, ethyl ester	109-95-5						10,000
Norbormide	991-42-4	100/10,000	100				
Norflurazon	27314-13-2				313		
1,2,3,4,6,7,8,9-octachlorodibenzo-p-dioxin	3268-87-9				313!^		
1,2,3,4,6,7,8,9-octachlorodibenzofuran	39001-02-0				313!^		
Octachloronaphthalene	2234-13-1				313		
Octachlorostyrene	29082-74-4				313^		
Octanoic acid, 2,6-dibromo-4-cyanophenyl ester	1689-99-2				X		
Oleum (fuming sulfuric acid)	8014-95-7			1,000			10,000
Organorhodium Complex (PMN-82-147)	0	10/10,000	10	**			
Oryzalin	19044-88-3				313		
Osmium oxide OsO4 (T-4)-	20816-12-0			1,000	X	P087	
Osmium tetroxide	20816-12-0			1,000	313	P087	
Ouabain	630-60-4	100/10,000	100				
7-Oxabicyclo(2.2.1)heptane-2,3-dicarboxylic acid, dipotassium salt	2164-07-0				X		
Oxamyl	23135-22-0	100/10,000	1*	1*		P194	
Oxetane, 3,3-bis(chloromethyl)-	78-71-7	500	500				
Oxirane	75-21-8	1,000	10	10	X	U115	10,000
Oxirane, (chloromethyl)-	106-89-8	1,000	100	100	X	U041	20,000
Oxirane, methyl-	75-56-9	10,000	100	100	X		10,000
Oxydemeton methyl	301-12-2				313		
Oxydiazon	19666-30-9				313		
Oxydisulfoton	2497-07-6	500	500				
Oxyfluorfen	42874-03-3				313		
Ozone	10028-15-6	100	100		313		
Paraformaldehyde	30525-89-4			1,000			
Paraldehyde	123-63-7			1,000	313	U182	
Paraquat dichloride	1910-42-5	10/10,000	10		313		
Paraquat methosulfate	2074-50-2	10/10,000	10				
Parathion	56-38-2	100	10	10	313	P089	
Parathion-methyl	298-00-0	100/10,000	100	100	X	P071	
Paris green	12002-03-8	500/10,000	1	1			
PCBs	1336-36-3			1	X		
PCNB	82-68-8			100	X	U185	
PCP	87-86-5			10	X		
Pebulate	1114-71-2				313		
Pendimethalin	40487-42-1				313^		
Pentaborane	19624-22-7	500	500				
Pentachlorobenzene	608-93-5			10	313^	U183	

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
1,2,3,7,8-pentachlorodibenzo-p-dioxin	40321-76-4				313!^		
1,2,3,7,8-pentachlorodibenzofuran	57117-41-6				313!^		
2,3,4,7,8-pentachlorodibenzofuran	57117-31-4				313!^		
Pentachloroethane	76-01-7			10	313	U184	
Pentachloronitrobenzene	82-68-8			100	X	U185	
Pentachlorophenol	87-86-5			10	313		
Pentadecylamine	2570-26-5	100/10,000	100				
1,3-Pentadiene	504-60-9			100		U186	10,000
Pentane	109-66-0						10,000
1-Pentene	109-67-1						10,000
2-Pentene, (E)-	646-04-8						10,000
2-Pentene, (Z)-	627-20-3						10,000
Pentobarbital sodium	57-33-0				313		
Peracetic acid	79-21-0	500	500		313		10,000
Perchloroethylene	127-18-4			100	X	U210	
Perchloromethyl mercaptan	594-42-3	500	100	100	313		10,000
Permethrin	52645-53-1				313		
Phenacetin	62-44-2			100		U187	
Phenanthrene	85-01-8			5,000	313		
Phenol	108-95-2	500/10,000	1,000	1,000	313	U188	
Phenol, 2-(1-methylethoxy)-, methylcarbamate	114-26-1			100	X	U411	
Phenol, 3-(1-methylethyl)-, methylcarbamate	64-00-6	500/10,000	1*	1*		P202	
Phenol, 2,2'-thiobis[4-chloro-6-methyl-	4418-66-0	100/10,000	100				
Phenothrin	26002-80-2				313		
Phenoxarsine, 10,10'-oxydi-	58-36-6	500/10,000	500				
(2-(4-Phenoxyphenoxy)ethyl carbamic acid ethyl ester	72490-01-8				X		
Phenyl dichloroarsine	696-28-6	500	1	1		P036	
(1,2-Phenylenebis(iminocarbonothioyl)) biscarbamic acid diethyl ester	23564-06-9				X		
1,2-Phenylenediamine	95-54-5				313		
1,3-Phenylenediamine	108-45-2				313		
p-Phenylenediamine	106-50-3			5,000	313		
1,2-Phenylenediamine dihydrochloride	615-28-1				313		
1,4-Phenylenediamine dihydrochloride	624-18-0				313		
1,3-Phenylene diisocyanate	123-61-5				313#		
1,4-Phenylene diisocyanate	104-49-4				313#		
Phenylhydrazine hydrochloride	59-88-1	1,000/10,000	1,000				
Phenylmercuric acetate	62-38-4	500/10,000	100	100	313c	P092	
Phenylmercury acetate	62-38-4	500/10,000	100	100	313c	P092	
5-(Phenylmethyl)-3-furanyl)methyl 2,2-dimethyl-3-(2-methyl-1-propenyl)cyclopropanecarboxyl	10453-86-8				X		

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
ate							
2-Phenylphenol	90-43-7				313		
Phenylsilatrane	2097-19-0	100/10,000	100				
Phenylthiourea	103-85-5	100/10,000	100	100		P093	
Phenytoin	57-41-0				313		
Phorate	298-02-2	10	10	10		P094	
Phosacetim	4104-14-7	100/10,000	100				
Phosfolan	947-02-4	100/10,000	100				
Phosgene	75-44-5	10	10	10	313	P095	500
Phosmet	732-11-6	10/10,000	10				
Phosphamidon	13171-21-6	100	100				
Phosphine	7803-51-2	500	100	100	313	P096	5,000
Phosphonic acid, (2,2,2-trichloro-1-hydroxyethyl)-,dimethyl ester	52-68-6			100	X		
Phosphonothioic acid, methyl-, O-ethyl O-(4-(methylthio)phenyl) ester	2703-13-1	500	500				
Phosphonothioic acid, methyl-, S-(2-(bis(1-methylethyl)amino)ethyl) O-ethyl ester	50782-69-9	100	100				
Phosphonothioic acid, methyl-, O-(4-nitrophenyl) O-phenyl ester	2665-30-7	500	500				
Phosphoric acid	7664-38-2			5,000			
Phosphoric acid, 2-chloro-1-(2,3,5-trichlorophenyl) ethenyl dimethyl ester	961-11-5				X		
Phosphoric acid, 2-dichloroethenyl dimethyl ester	62-73-7	1,000	10	10	X		
Phosphoric acid, dimethyl 4-(methylthio) phenyl ester	3254-63-5	500	500				
Phosphorodithioic acid O-ethyl S,S-dipropyl ester	13194-48-4	1,000	1,000		X		
Phosphorothioic acid, O,O-diethyl-O-(4-nitrophenyl) ester	56-38-2	100	10	10	X	P089	
Phosphorothioic acid, O,O-dimethyl-5-(2-(methylthio)ethyl)ester	2587-90-8	500	500				
Phosphorous trichloride	7719-12-2	1,000	1,000	1,000			15,000
Phosphorus	7723-14-0	100	1	1			
Phosphorus (yellow or white)	7723-14-0	100	1	1	313		
Phosphorus oxychloride	10025-87-3	500	1,000	1,000			5,000
Phosphorus pentachloride	10026-13-8	500	500				
Phosphorus trichloride	7719-12-2	1,000	1,000	1,000			15,000
Phosphoryl chloride	10025-87-3	500	1,000	1,000			5,000
Phthalate Esters	0			***			
Phthalic anhydride	85-44-9			5,000	313	U190	
Physostigmine	57-47-6	100/10,000	1*	1*		P204	
Physostigmine, salicylate (1:1)	57-64-7	100/10,000	1*	1*		P188	
Picloram	1918-02-1				313		
2-Picoline	109-06-8			5,000	X	U191	
Picric acid	88-89-1				313		

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Picrotoxin	124-87-8	500/10,000	500				
N,N'-(1,4-Piperazinediylbis(2,2,2-trichloroethylidene)) bisformamide	26644-46-2				X		
Piperidine	110-89-4	1,000	1,000				15,000
Piperonyl butoxide	51-03-6				313		
Pirimifos-ethyl	23505-41-1	1,000	1,000				
Pirimiphos methyl	29232-93-7				313		
Plumbane, tetramethyl-	75-74-1	100	100				10,000
Polybrominated Biphenyls (PBBs)	N575				313		
Polychlorinated alkanes (C10 to C13)	N583				313		
Polychlorinated biphenyls	1336-36-3			1	313^		
Polycyclic aromatic compounds (includes only 19 chemicals)	N590				313^		
Polycyclic organic matter	0			***			
Polymeric diphenylmethane diisocyanate	9016-87-9				313#		
Polynuclear Aromatic Hydrocarbons	0			***			
Potassium arsenate	7784-41-0			1	313c		
Potassium arsenite	10124-50-2	500/10,000	1	1	313c		
Potassium bichromate	7778-50-9			10	313c		
Potassium bromate	7758-01-2				313		
Potassium chromate	7789-00-6			10	313c		
Potassium cyanide	151-50-8	100	10	10	313c	P098	
Potassium dimethyldithiocarbamate	128-03-0				313		
Potassium hydroxide	1310-58-3			1,000			
Potassium N-methyldithiocarbamate	137-41-7				313		
Potassium permanganate	7722-64-7			100	313c		
Potassium silver cyanide	506-61-6	500	1	1	313c	P099	
Profenofos	41198-08-7				313		
Promecarb	2631-37-0	500/10,000	1*	1*		P201	
Prometryn	7287-19-6				313		
Pronamide	23950-58-5			5,000	313	U192	
Propachlor	1918-16-7				313		
1,2-Propadiene	463-49-0						10,000
Propadiene	463-49-0						10,000
2-Propanamine	75-31-0						10,000
Propane	74-98-6						10,000
Propane, 2-chloro-	75-29-6						10,000
Propane 1,2-dichloro-	78-87-5			1,000	X	U083	
Propane, 2,2-dimethyl-	463-82-1						10,000
Propane, 2-methyl	75-28-5						10,000
Propanenitrile	107-12-0	500	10	10		P101	10,000
Propanenitrile, 2-methyl-	78-82-0	1,000	1,000				20,000
1,3-Propane sultone	1120-71-4			10	X	U193	
Propane sultone	1120-71-4			10	313	U193	
Propanil	709-98-8				313		

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Propargite	2312-35-8			10	313		
Propargyl alcohol	107-19-7			1,000	313	P102	
Propargyl bromide	106-96-7	10	10				
2-Propenal	107-02-8	500	1	1	X	P003	5,000
2-Propen-1-amine	107-11-9	500	500		X		10,000
Propene	115-07-1				X		10,000
1-Propene	115-07-1				X		10,000
1-Propene, 1-chloro-	590-21-6						10,000
1-Propene, 2-chloro-	557-98-2						10,000
1-Propene, 2-methyl-	115-11-7						10,000
2-Propenenitrile	107-13-1	10,000	100	100	X	U009	20,000
2-Propenenitrile, 2-methyl-	126-98-7	500	1,000	1,000	X	U152	10,000
2-Propen-1-ol	107-18-6	1,000	100	100	X	P005	15,000
2-Propenoyl chloride	814-68-6	100	100				5,000
Propetamphos	31218-83-4				313		
Propham	122-42-9			1*		U373	
Propiconazole	60207-90-1				313		
beta-Propiolactone	57-57-8	500	10	10	313		
Propionaldehyde	123-38-6			1,000	313		
Propionic acid	79-09-4			5,000			
Propionic anhydride	123-62-6			5,000			
Propionitrile	107-12-0	500	10	10		P101	10,000
Propionitrile, 3-chloro-	542-76-7	1,000	1,000	1,000	X	P027	
Propiophenone, 4'-amino	70-69-9	100/10,000	100				
Propoxur	114-26-1			100	313	U411	
n-Propylamine	107-10-8			5,000		U194	
Propyl chloroformate	109-61-5	500	500				15,000
Propylene	115-07-1				313		10,000
Propyleneimine	75-55-8	10,000	1	1	313	P067	10,000
Propylene oxide	75-56-9	10,000	100	100	313		10,000
1-Propyne	74-99-7						10,000
Propyne	74-99-7						10,000
Prothoate	2275-18-5	100/10,000	100				
Pyrene	129-00-0	1,000/10,000	5,000	5,000			
Pyrethrins	121-21-1			1			
Pyrethrins	121-29-9			1			
Pyrethrins	8003-34-7			1			
Pyridine	110-86-1			1,000	313	U196	
Pyridine, 4-amino-	504-24-5	500/10,000	1,000	1,000		P008	
Pyridine, 3-(1-methyl-2-pyrrolidinyl)-,(S)-	54-11-5	100	100	100		P075	
Pyridine, 2-methyl-5-vinyl-	140-76-1	500	500				
Pyridine, 4-nitro-, 1-oxide	1124-33-0	500/10,000	500				
2,4-(1H,3H)-Pyrimidinedione, 5-bromo-6-methyl-3-(1-methylpropyl), lithium salt	53404-19-6				X		
Pyriminil	53558-25-1	100/10,000	100				
Quinoline	91-22-5			5,000	313		
Quinone	106-51-4			10	313	U197	
Quintozene	82-68-8			100	313	U185	
Quizalofop-ethyl	76578-14-8				313		
Reserpine	50-55-5			5,000		U200	

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Resmethrin	10453-86-8				313		
Resorcinol	108-46-3			5,000		U201	
Saccharin (manufacturing)	81-07-2			100	313	U202	
Saccharin and salts	81-07-2			100		U202	
Safrole	94-59-7			100	313	U203	
Salcomine	14167-18-1	500/10,000	500				
Sarin	107-44-8	10	10				
Selenious acid	7783-00-8	1,000/10,000	10	10	313c	U204	
Selenious acid, dithallium(1+) salt	12039-52-0			1,000	313c	P114	
Selenium	7782-49-2			100	313		
Selenium Compounds	N725			***	313		
Selenium dioxide	7446-08-4			10	313c		
Selenium oxychloride	7791-23-3	500	500		313c		
Selenium sulfide	7488-56-4			10	313c	U205	
Selenourea	630-10-4			1,000		P103	
Semicarbazide hydrochloride	563-41-7	1,000/10,000	1,000				
Sethoxydim	74051-80-2				313		
Silane	7803-62-5						10,000
Silane, (4-aminobutyl)diethoxymethyl-	3037-72-7	1,000	1,000				
Silane, chlorotrimethyl-	75-77-4	1,000	1,000				10,000
Silane, dichloro-	4109-96-0						10,000
Silane, dichlorodimethyl-	75-78-5	500	500				5,000
Silane, tetramethyl-	75-76-3						10,000
Silane, trichloro-	10025-78-2						10,000
Silane, trichloromethyl-	75-79-6	500	500				5,000
Silver	7440-22-4			1,000	313		
Silver Compounds	N740			***	313		
Silver cyanide	506-64-9			1	313c	P104	
Silver nitrate	7761-88-8			1	313c		
Silvex (2,4,5-TP)	93-72-1			100			
Simazine	122-34-9				313		
Sodium	7440-23-5			10			
Sodium arsenate	7631-89-2	1,000/10,000	1	1	313c		
Sodium arsenite	7784-46-5	500/10,000	1	1	313c		
Sodium azide (Na(N3))	26628-22-8	500	1,000	1,000	313	P105	
Sodium bichromate	10588-01-9			10	313c		
Sodium bifluoride	1333-83-1			100			
Sodium bisulfite	7631-90-5			5,000			
Sodium cacodylate	124-65-2	100/10,000	100				
Sodium chromate	7775-11-3			10	313c		
Sodium cyanide (Na(CN))	143-33-9	100	10	10	313c	P106	
Sodium dicamba	1982-69-0				313		
Sodium dimethyldithiocarbamate	128-04-1				313		
Sodium dodecylbenzenesulfonate	25155-30-0			1,000			
Sodium fluoride	7681-49-4			1,000			
Sodium fluoroacetate	62-74-8	10/10,000	10	10	313	P058	
Sodium hydrosulfide	16721-80-5			5,000			
Sodium hydroxide	1310-73-2			1,000			
Sodium hypochlorite	7681-52-9			100			

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Sodium hypochlorite	10022-70-5			100			
Sodium methylate	124-41-4			1,000			
Sodium methyldithiocarbamate	137-42-8				X		
Sodium nitrite	7632-00-0			100	313		
Sodium pentachlorophenate	131-52-2				313		
Sodium o-phenylphenoxide	132-27-4				313		
Sodium phosphate, dibasic	7558-79-4			5,000			
Sodium phosphate, dibasic	10039-32-4			5,000			
Sodium phosphate, dibasic	10140-65-5			5,000			
Sodium phosphate, tribasic	7601-54-9			5,000			
Sodium phosphate, tribasic	7758-29-4			5,000			
Sodium phosphate, tribasic	7785-84-4			5,000			
Sodium phosphate, tribasic	10101-89-0			5,000			
Sodium phosphate, tribasic	10124-56-8			5,000			
Sodium phosphate, tribasic	10361-89-4			5,000			
Sodium selenate	13410-01-0	100/10,000	100		313c		
Sodium selenite	7782-82-3			100	313c		
Sodium selenite	10102-18-8	100/10,000	100	100	313c		
Sodium tellurite	10102-20-2	500/10,000	500				
Stannane, acetoxytriphenyl-	900-95-8	500/10,000	500				
Streptozotocin	18883-66-4			1		U206	
Strontium chromate	7789-06-2			10	313c		
Strychnine	57-24-9	100/10,000	10	10	313c	P108	
Strychnine and salts	N746				313		
Strychnine, and salts	57-24-9			10	313c	P108	
Strychnine, sulfate	60-41-3	100/10,000	10	10	313c		
Styrene	100-42-5			1,000	313		
Styrene oxide	96-09-3			100	313		
Sulfotep	3689-24-5	500	100	100		P109	
Sulfoxide, 3-chloropropyl octyl	3569-57-1	500	500				
Sulfur dioxide	7446-09-5	500	500				
Sulfur dioxide (anhydrous)	7446-09-5	500	500				5,000
Sulfur fluoride (SF4), (T-4)-	7783-60-0	100	100				2,500
Sulfuric acid	7664-93-9	1,000	1,000	1,000			
Sulfuric acid (aerosol forms only)	7664-93-9	1,000	1,000	1,000	313		
Sulfuric acid (fuming)	8014-95-7			1,000			10,000
Sulfuric acid, mixture with sulfur trioxide	8014-95-7			1,000			10,000
Sulfur monochloride	12771-08-3			1,000			
Sulfur phosphide	1314-80-3			100		U189	
Sulfur tetrafluoride	7783-60-0	100	100				2,500
Sulfur trioxide	7446-11-9	100	100				10,000
Sulfuryl fluoride	2699-79-8				313		
Sulprofos	35400-43-2				313		
2,4,5-T acid	93-76-5			1,000			
2,4,5-T amines	1319-72-8			5,000			
2,4,5-T amines	2008-46-0			5,000			
2,4,5-T amines	3813-14-7			5,000			
2,4,5-T amines	6369-96-6			5,000			
2,4,5-T amines	6369-97-7			5,000			
2,4,5-T esters	93-79-8			1,000			

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
2,4,5-T esters	1928-47-8			1,000			
2,4,5-T esters	2545-59-7			1,000			
2,4,5-T esters	25168-15-4			1,000			
2,4,5-T esters	61792-07-2			1,000			
2,4,5-T salts	13560-99-1			1,000			
Tabun	77-81-6	10	10				
Tebuthiuron	34014-18-1				313		
Tellurium hexafluoride	7783-80-4	100	100				
Temephos	3383-96-8				313		
TEPP	107-49-3	100	10	10		P111	
Terbacil	5902-51-2				313		
Terbufos	13071-79-9	100	100				
Tetrabromobisphenol A	79-94-7				313^		
1,2,4,5-Tetrachlorobenzene	95-94-3			5,000		U207	
2,3,7,8-tetrachlorodibenzofuran	51207-31-9				313!^		
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	1746-01-6			1	313!^		
1,1,1,2-Tetrachloroethane	630-20-6			100	313	U208	
1,1,2,2-Tetrachloroethane	79-34-5			100	313	U209	
Tetrachloroethylene	127-18-4			100	313	U210	
1,1,2,2-Tetrachloro-1-fluoroethane	354-14-3				313		
1,1,1,2-Tetrachloro-2-fluoroethane	354-11-0				313		
2,3,4,6-Tetrachlorophenol	58-90-2			10	313c		
Tetrachlorvinphos	961-11-5				313		
Tetracycline hydrochloride	64-75-5				313		
Tetraethyldithiopyrophosphate	3689-24-5	500	100	100		P109	
Tetraethyl lead	78-00-2	100	10	10	313c	P110	
Tetraethyl pyrophosphate	107-49-3	100	10	10		P111	
Tetraethyltin	597-64-8	100	100				
Tetrafluoroethylene	116-14-3						10,000
Tetrahydro-5,5-dimethyl-2(1H)-pyrimidinone(3-(4-(trifluoromethyl)phenyl)-1-(2-(4-(trifluoromethyl)phenyl)ethenyl)-2-propenylidene)hydrazone	67485-29-4				X		
Tetrahydro-3,5-dimethyl-2H-1,3,5-thiadiazine-2-thione	533-74-4				X		
Tetrahydro-3,5-dimethyl-2H-1,3,5-thiadiazine-2-thione, ion(1-), sodium	53404-60-7				X		
Tetramethrin	7696-12-0				313		
2,2,3,3-Tetramethylcyclopropane carboxylic acid cyano(3-phenoxyphenyl)methyl ester	39515-41-8				X		
Tetramethyllead	75-74-1	100	100		313c		10,000
Tetramethylsilane	75-76-3						10,000
Tetranitromethane	509-14-8	500	10	10		P112	10,000
Thallic oxide	1314-32-5			100	313c	P113	
Thallium	7440-28-0			1,000	313		
Thallium(I) acetate	563-68-8			100	313c	U214	

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Thallium(I) carbonate	6533-73-9	100/10,000	100	100	313c	U215	
Thallium chloride TlCl	7791-12-0	100/10,000	100	100	313c	U216	
Thallium Compounds	N760			***	313		
Thallium(I) nitrate	10102-45-1			100	313c	U217	
Thallium sulfate	10031-59-1	100/10,000	100	100	313c		
Thallium(I) sulfate	7446-18-6	100/10,000	100	100	313c	P115	
Thallous carbonate	6533-73-9	100/10,000	100	100	313c	U215	
Thallous chloride	7791-12-0	100/10,000	100	100	313c	U216	
Thallous malonate	2757-18-8	100/10,000	100				
Thallous sulfate	7446-18-6	100/10,000	100	100	313c	P115	
Thiabendazole	148-79-8				313		
2-(4-Thiazolyl)-1H-benzimidazole	148-79-8				X		
Thioacetamide	62-55-5			10	313	U218	
Thiobencarb	28249-77-6				313		
Thiocarbazide	2231-57-4	1,000/10,000	1,000				
Thiocyanic acid, methyl ester	556-64-9	10,000	10,000				20,000
4,4'-Thiodianiline	139-65-1				313		
Thiodicarb	59669-26-0			1*	313	U410	
Thiofanox	39196-18-4	100/10,000	100	100		P045	
Thiomethanol	74-93-1	500	100	100	X	U153	10,000
Thionazin	297-97-2	500	100	100		P040	
Thiophanate ethyl	23564-06-9				313		
Thiophanate-methyl	23564-05-8			1*	313	U409	
Thiophenol	108-98-5	500	100	100		P014	
Thiosemicarbazide	79-19-6	100/10,000	100	100	313	P116	
Thiourea	62-56-6			10	313	U219	
Thiourea, (2-chlorophenyl)-	5344-82-1	100/10,000	100	100		P026	
Thiourea, (2-methylphenyl)-	614-78-8	500/10,000	500				
Thiourea, 1-naphthalenyl-	86-88-4	500/10,000	100	100		P072	
Thiram	137-26-8			10	313	U244	
Thorium dioxide	1314-20-1				313		
Titanium chloride (TiCl4) (T-4)-	7550-45-0	100	1,000	1,000	X		2,500
Titanium tetrachloride	7550-45-0	100	1,000	1,000	313		2,500
o-Tolidine	119-93-7			10	X	U095	
o-Tolidine dihydrochloride	612-82-8				X		
o-Tolidine dihydrofluoride	41766-75-0				X		
Toluene	108-88-3			1,000	313	U220	
Toluenediamine	25376-45-8			10	X	U221	
Toluene-2,4-diisocyanate	584-84-9	500	100	100	313		10,000
Toluene-2,6-diisocyanate	91-08-7	100	100	100	313		10,000
Toluenediisocyanate (mixed isomers)	26471-62-5			100	313	U223	10,000
Toluene diisocyanate (unspecified isomer)	26471-62-5			100	X	U223	10,000
o-Toluidine	95-53-4			100	313	U328	
p-Toluidine	106-49-0			100		U353	
o-Toluidine hydrochloride	636-21-5			100	313	U222	
Toxaphene	8001-35-2	500/10,000	1	1	313^	P123	
2,4,5-TP esters	32534-95-5			100			
Triadimefon	43121-43-3				313		
Triallate	2303-17-5			1*	313	U389	

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Triamiphos	1031-47-6	500/10,000	500				
Triaziquone	68-76-8				313		
Triazofos	24017-47-8	500	500				
Tribenuron methyl	101200-48-0				313		
Tribromomethane	75-25-2			100	X	U225	
Tributyltin fluoride	1983-10-4				313		
Tributyltin methacrylate	2155-70-6				313		
S,S,S-Tributyltrithiophosphate	78-48-8				313		
Trichlorfon	52-68-6			100	313		
Trichloroacetyl chloride	76-02-8	500	500		313		
1,2,4-Trichlorobenzene	120-82-1			100	313		
Trichloro(chloromethyl)silane	1558-25-4	100	100				
Trichloro(dichlorophenyl)silane	27137-85-5	500	500				
1,1,1-Trichloroethane	71-55-6			1,000	313	U226	
1,1,2-Trichloroethane	79-00-5			100	313	U227	
Trichloroethylene	79-01-6			100	313	U228	
Trichloroethylsilane	115-21-9	500	500				
Trichlorofluoromethane	75-69-4			5,000	313	U121	
Trichloromethanesulfenyl chloride	594-42-3	500	100	100	X		10,000
Trichloromonofluoromethane	75-69-4			5,000	X	U121	
Trichloronate	327-98-0	500	500				
Trichlorophenol	25167-82-2			10	313c		
2,3,4-Trichlorophenol	15950-66-0			10	313c		
2,3,5-Trichlorophenol	933-78-8			10	313c		
2,3,6-Trichlorophenol	933-75-5			10	313c		
2,4,5-Trichlorophenol	95-95-4			10	313		
2,4,6-Trichlorophenol	88-06-2			10	313		
3,4,5-Trichlorophenol	609-19-8			10			
Trichlorophenylsilane	98-13-5	500	500				
1,2,3-Trichloropropane	96-18-4				313		
Trichlorosilane	10025-78-2						10,000
Triclopyr triethylammonium salt	57213-69-1				313		
Triethanolamine dodecylbenzene sulfonate	27323-41-7			1,000			
Triethoxysilane	998-30-1	500	500				
Triethylamine	121-44-8			5,000	313	U404	
Trifluorochloroethylene	79-38-9						10,000
2-(4-((5-(Trifluoromethyl)-2-pyridinyl)oxy)-phenoxy)propanoic acid, butyl ester	69806-50-4				X		
Trifluralin	1582-09-8			10	313^		
Triforine	26644-46-2				313		
Trimethylamine	75-50-3			100			10,000
1,2,4-Trimethylbenzene	95-63-6				313		
Trimethylchlorosilane	75-77-4	1,000	1,000				10,000
2,2,4-Trimethylhexamethylene diisocyanate	16938-22-0				313#		
2,4,4-Trimethylhexamethylene diisocyanate	15646-96-5				313#		
Trimethylolpropane phosphite	824-11-3	100/10,000	100				
2,2,4-Trimethylpentane	540-84-1			1,000			

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
2,3,5-Trimethylphenyl methylcarbamate	2655-15-4				313		
Trimethyltin chloride	1066-45-1	500/10,000	500				
1,3,5-Trinitrobenzene	99-35-4			10		U234	
Triphenyltin chloride	639-58-7	500/10,000	500		313		
Triphenyltin hydroxide	76-87-9				313		
Tris(2-chloroethyl)amine	555-77-1	100	100				
Tris(2,3-dibromopropyl) phosphate	126-72-7			10	313	U235	
Tris(dimethylcarbamodithioato-S,S')iron	14484-64-1				X		
Trypan blue	72-57-1			10	313	U236	
Uracil mustard	66-75-1			10		U237	
Uranyl acetate	541-09-3			100			
Uranyl nitrate	10102-06-4			100			
Uranyl nitrate	36478-76-9			100			
Urea, N,N-dimethyl-N'-[3-(trifluoromethyl)phenyl]-	2164-17-2				X		
Urethane	51-79-6			100	313	U238	
Valinomycin	2001-95-8	1,000/10,000	1,000				
Vandium (except when contained in an alloy)	7440-62-2				313		
Vanadium pentoxide	1314-62-1	100/10,000	1,000	1,000	313c	P120	
Vanadyl sulfate	27774-13-6			1,000	313c		
Vandium Compounds	N770				313		
Vikane	2699-79-8				X		
Vinclozolin	50471-44-8				313		
Vinyl acetate	108-05-4	1,000	5,000	5,000	313		15,000
Vinyl acetate monomer	108-05-4	1,000	5,000	5,000	X		15,000
Vinyl acetylene	689-97-4						10,000
Vinyl bromide	593-60-2			100	313		
Vinyl chloride	75-01-4			1	313	U043	10,000
Vinyl ethyl ether	109-92-2						10,000
Vinyl fluoride	75-02-5						10,000
Vinylidene chloride	75-35-4			100	313	U078	10,000
Vinylidene fluoride	75-38-7						10,000
Vinyl methyl ether	107-25-5						10,000
Warfarin	81-81-2	500/10,000	100	100	X 313c	P001	
Warfarin and salts	N874				313		
Warfarin, & salts, conc.>0.3%	81-81-2			100	X 313c	P001	
Warfarin sodium	129-06-6	100/10,000	100	100	313c		
m-Xylene	108-38-3			1,000	313	U239	
o-Xylene	95-47-6			1,000	313	U239	
p-Xylene	106-42-3			100	313	U239	
Xylene (mixed isomers)	1330-20-7			100	313	U239	
Xylenol	1300-71-6			1,000			
2,6-Xylidine	87-62-7				313		
Xylylene dichloride	28347-13-9	100/10,000	100				
Zinc	7440-66-6			1,000			
Zinc (fume or dust)	7440-66-6			1,000	313		
Zinc acetate	557-34-6			1,000	313c		
Zinc ammonium chloride	14639-97-5			1,000	313c		
Zinc ammonium chloride	14639-98-6			1,000	313c		

NAME	CAS/ 313 Category Codes	Section 302 (EHS) TPQ	Section 304 EHS RQ	CERCLA RQ	Section 313	RCRA CODE	CAA 112(r) TQ
Zinc ammonium chloride	52628-25-8			1,000	313c		
Zinc borate	1332-07-6			1,000	313c		
Zinc bromide	7699-45-8			1,000	313c		
Zinc carbonate	3486-35-9			1,000	313c		
Zinc chloride	7646-85-7			1,000	313c		
Zinc Compounds	N982			***	313		
Zinc cyanide	557-21-1			10	313c	P121	
Zinc, dichloro(4,4-dimethyl-5((((methylamino)carbonyl)oxy)imino)pentanenitrile)-, (T-4)-	58270-08-9	100/10,000	100		313c		
Zinc fluoride	7783-49-5			1,000	313c		
Zinc formate	557-41-5			1,000	313c		
Zinc hydrosulfite	7779-86-4			1,000	313c		
Zinc nitrate	7779-88-6			1,000	313c		
Zinc phenolsulfonate	127-82-2			5,000	313c		
Zinc phosphide	1314-84-7	500	100	100	313c	P122	
Zinc phosphide (conc. <= 10%)	1314-84-7	500	100	100	313c	U249	
Zinc phosphide (conc. > 10%)	1314-84-7	500	100	100	313c	P122	
Zinc silicofluoride	16871-71-9			5,000	313c		
Zinc sulfate	7733-02-0			1,000	313c		
Zineb	12122-67-7				313		
Ziram	137-30-4			1*		P205	
Zirconium nitrate	13746-89-9			5,000			
Zirconium potassium fluoride	16923-95-8			1,000			
Zirconium sulfate	14644-61-2			5,000			
Zirconium tetrachloride	10026-11-6			5,000			

RADIONUCLIDES LISTED UNDER CERCLA
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SEE 40 CFR PART 302, TABLE 302.4, APPENDIX B, FOR MORE INFORMATION

Radionuclide Name	Atomic Number	RQ (curies)
Radionuclides (unlisted)		1
Actinium-224	89	100
Actinium-225	89	1
Actinium-226	89	10
Actinium-227	89	0.001
Actinium-228	89	10
Aluminum-026	13	10
Americium-237	95	1000
Americium-238	95	100
Americium-239	95	100
Americium-240	95	10
Americium-241	95	0.01
Americium-242	95	100
Americium-242m	95	0.01
Americium-243	95	0.01
Americium-244	95	10
Americium-244m	95	1000
Americium-245	95	1000
Americium-246	95	1000
Americium-246m	95	1000
Antimony-115	51	1000
Antimony-116	51	1000
Antimony-116m	51	100
Antimony-117	51	1000
Antimony-118m	51	10
Antimony-119	51	1000
Antimony-120 (16 min)	51	1000
Antimony-120 (5.76 day)	51	10
Antimony-122	51	10
Antimony-124	51	10
Antimony-124m	51	1000
Antimony-125	51	10
Antimony-126	51	10
Antimony-126m	51	1000
Antimony-127	51	10
Antimony-128 (10.4 min)	51	1000
Antimony-128 (9.01 hours)	51	10
Antimony-129	51	100
Antimony-130	51	100
Antimony-131	51	1000
Argon-039	18	1000
Argon-041	18	10
Arsenic-069	33	1000
Arsenic-070	33	100
Arsenic-071	33	100
Arsenic-072	33	10
Arsenic-073	33	100
Arsenic-074	33	10
Arsenic-076	33	100
Arsenic-077	33	1000
Arsenic-078	33	100
Astatine-207	85	100
Astatine-211	85	100
Barium-126	56	1000

Radionuclide Name	Atomic Number	RQ (curies)
Barium-128	56	10
Barium-131	56	10
Barium-131m	56	1000
Barium-133	56	10
Barium-133m	56	100
Barium-135m	56	1000
Barium-139	56	1000
Barium-140	56	10
Barium-141	56	1000
Barium-142	56	1000
Berkelium-245	97	100
Berkelium-246	97	10
Berkelium-247	97	0.01
Berkelium-249	97	1
Berkelium-250	97	100
Beryllium-007	4	100
Beryllium-010	4	1
Bismuth-200	83	100
Bismuth-201	83	100
Bismuth-202	83	1000
Bismuth-203	83	10
Bismuth-205	83	10
Bismuth-206	83	10
Bismuth-207	83	10
Bismuth-210	83	10
Bismuth-210m	83	0.1
Bismuth-212	83	100
Bismuth-213	83	100
Bismuth-214	83	100
Bromine-074	35	100
Bromine-074m	35	100
Bromine-075	35	100
Bromine-076	35	10
Bromine-077	35	100
Bromine-080	35	1000
Bromine-080m	35	1000
Bromine-082	35	10
Bromine-083	35	1000
Bromine-084	35	100
Cadmium-104	48	1000
Cadmium-107	48	1000
Cadmium-109	48	1
Cadmium-113	48	0.1
Cadmium-113m	48	0.1
Cadmium-115	48	100
Cadmium-115m	48	10
Cadmium-117	48	100
Cadmium-117m	48	10
Calcium-041	20	10
Calcium-045	20	10
Calcium-047	20	10
Californium-244	98	1000
Californium-246	98	10
Californium-248	98	0.1

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Radionuclide Name	Atomic Number	RQ (curies)
Californium-249	98	0.01
Californium-250	98	0.01
Californium-251	98	0.01
Californium-252	98	0.1
Californium-253	98	10
Californium-254	98	0.1
Carbon-011	6	1000
Carbon-014	6	10
Cerium-134	58	10
Cerium-135	58	10
Cerium-137	58	1000
Cerium-137m	58	100
Cerium-139	58	100
Cerium-141	58	10
Cerium-143	58	100
Cerium-144	58	1
Cesium-125	55	1000
Cesium-127	55	100
Cesium-129	55	100
Cesium-130	55	1000
Cesium-131	55	1000
Cesium-132	55	10
Cesium-134	55	1
Cesium-134m	55	1000
Cesium-135	55	10
Cesium-135m	55	100
Cesium-136	55	10
Cesium-137	55	1
Cesium-138	55	100
Chlorine-036	17	10
Chlorine-038	17	100
Chlorine-039	17	100
Chromium-048	24	100
Chromium-049	24	1000
Chromium-051	24	1000
Cobalt-055	27	10
Cobalt-056	27	10
Cobalt-057	27	100
Cobalt-058	27	10
Cobalt-058m	27	1000
Cobalt-060	27	10
Cobalt-060m	27	1000
Cobalt-061	27	1000
Cobalt-062m	27	1000
Copper-060	29	100
Copper-061	29	100
Copper-064	29	1000
Copper-067	29	100
Curium-238	96	1000
Curium-240	96	1
Curium-241	96	10
Curium-242	96	1
Curium-243	96	0.01
Curium-244	96	0.01
Curium-245	96	0.01
Curium-246	96	0.01
Curium-247	96	0.01
Curium-248	96	0.001
Curium-249	96	1000
Dysprosium-155	66	100
Dysprosium-157	66	100
Dysprosium-159	66	100
Dysprosium-165	66	1000
Dysprosium-166	66	10
Einsteinium-250	99	10
Einsteinium-251	99	1000
Einsteinium-253	99	10
Einsteinium-254	99	0.1
Einsteinium-254m	99	1
Erbium-161	68	100
Erbium-165	68	1000
Erbium-169	68	100
Erbium-171	68	100
Erbium-172	68	10
Europium-145	63	10
Europium-146	63	10
Europium-147	63	10
Europium-148	63	10
Europium-149	63	100
Europium-150 (12.6 hours)	63	1000
Europium-150 (34.2 yr)	63	10
Europium-152	63	10
Europium-152m	63	100
Europium-154	63	10
Europium-155	63	10
Europium-156	63	10
Europium-157	63	10
Europium-158	63	1000
Fermium-252	100	10
Fermium-253	100	10
Fermium-254	100	100
Fermium-255	100	100
Fermium-257	100	1
Fluorine-018	9	1000
Francium-222	87	100
Francium-223	87	100
Gadolinium-145	64	100
Gadolinium-146	64	10
Gadolinium-147	64	10
Gadolinium-148	64	0.001
Gadolinium-149	64	100
Gadolinium-151	64	100
Gadolinium-152	64	0.001
Gadolinium-153	64	10
Gadolinium-159	64	1000
Gallium-065	31	1000
Gallium-066	31	10
Gallium-067	31	100

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Radionuclide Name	Atomic Number	RQ (curies)	Radionuclide Name	Atomic Number	RQ (curies)
Gallium-068	31	1000	Indium-115m	49	100
Gallium-070	31	1000	Indium-116m	49	100
Gallium-072	31	10	Indium-117	49	1000
Gallium-073	31	100	Indium-117m	49	100
Germanium-066	32	100	Indium-119m	49	1000
Germanium-067	32	1000	Iodine-120	53	10
Germanium-068	32	10	Iodine-120m	53	100
Germanium-069	32	10	Iodine-121	53	100
Germanium-071	32	1000	Iodine-123	53	10
Germanium-075	32	1000	Iodine-124	53	0.1
Germanium-077	32	10	Iodine-125	53	0.01
Germanium-078	32	1000	Iodine-126	53	0.01
Gold-193	79	100	Iodine-128	53	1000
Gold-194	79	10	Iodine-129	53	0.001
Gold-195	79	100	Iodine-130	53	1
Gold-198	79	100	Iodine-131	53	0.01
Gold-198m	79	10	Iodine-132	53	10
Gold-199	79	100	Iodine-132m	53	10
Gold-200	79	1000	Iodine-133	53	0.1
Gold-200m	79	10	Iodine-134	53	100
Gold-201	79	1000	Iodine-135	53	10
Hafnium-170	72	100	Iridium-182	77	1000
Hafnium-172	72	1	Iridium-184	77	100
Hafnium-173	72	100	Iridium-185	77	100
Hafnium-175	72	100	Iridium-186	77	10
Hafnium-177m	72	1000	Iridium-187	77	100
Hafnium-178m	72	0.1	Iridium-188	77	10
Hafnium-179m	72	100	Iridium-189	77	100
Hafnium-180m	72	100	Iridium-190	77	10
Hafnium-181	72	10	Iridium-190m	77	1000
Hafnium-182	72	0.1	Iridium-192	77	10
Hafnium-182m	72	100	Iridium-192m	77	100
Hafnium-183	72	100	Iridium-194	77	100
Hafnium-184	72	100	Iridium-194m	77	10
Holmium-155	67	1000	Iridium-195	77	1000
Holmium-157	67	1000	Iridium-195m	77	100
Holmium-159	67	1000	Iron-052	26	100
Holmium-161	67	1000	Iron-055	26	100
Holmium-162	67	1000	Iron-059	26	10
Holmium-162m	67	1000	Iron-060	26	0.1
Holmium-164	67	1000	Krypton-074	36	10
Holmium-164m	67	1000	Krypton-076	36	10
Holmium-166	67	100	Krypton-077	36	10
Holmium-166m	67	1	Krypton-079	36	100
Holmium-167	67	100	Krypton-081	36	1000
Hydrogen-003	1	100	Krypton-083m	36	1000
Indium-109	49	100	Krypton-085	36	1000
Indium-110 (4.9 hours)	49	10	Krypton-085m	36	100
Indium-110 (69.1 min)	49	100	Krypton-087	36	10
Indium-111	49	100	Krypton-088	36	10
Indium-112	49	1000	Lanthanum-131	57	1000
Indium-113m	49	1000	Lanthanum-132	57	100
Indium-114m	49	10	Lanthanum-135	57	1000
Indium-115	49	0.1	Lanthanum-137	57	10

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Radionuclide Name	Atomic Number	RQ (curies)	Radionuclide Name	Atomic Number	RQ (curies)
Lanthanum-138	57	1	Molybdenum-099	42	100
Lanthanum-140	57	10	Molybdenum-101	42	1000
Lanthanum-141	57	1000	Neodymium-136	60	1000
Lanthanum-142	57	100	Neodymium-138	60	1000
Lanthanum-143	57	1000	Neodymium-139	60	1000
Lead-195m	82	1000	Neodymium-139m	60	100
Lead-198	82	100	Neodymium-141	60	1000
Lead-199	82	100	Neodymium-147	60	10
Lead-200	82	100	Neodymium-149	60	100
Lead-201	82	100	Neodymium-151	60	1000
Lead-202	82	1	Neptunium-232	93	1000
Lead-202m	82	10	Neptunium-233	93	1000
Lead-203	82	100	Neptunium-234	93	10
Lead-205	82	100	Neptunium-235	93	1000
Lead-209	82	1000	Neptunium-236 (1.2E 5 yr)	93	0.1
Lead-210	82	0.01	Neptunium-236 (22.5 hours)	93	100
Lead-211	82	100	Neptunium-237	93	0.01
Lead-212	82	10	Neptunium-238	93	10
Lead-214	82	100	Neptunium-239	93	100
Lutetium-169	71	10	Neptunium-240	93	100
Lutetium-170	71	10	Nickel-056	28	10
Lutetium-171	71	10	Nickel-057	28	10
Lutetium-172	71	10	Nickel-059	28	100
Lutetium-173	71	100	Nickel-063	28	100
Lutetium-174	71	10	Nickel-065	28	100
Lutetium-174m	71	10	Nickel-066	28	10
Lutetium-176	71	1	Niobium-088	41	100
Lutetium-176m	71	1000	Niobium-089 (122 minutes)	41	100
Lutetium-177	71	100	Niobium-089 (66 minutes)	41	100
Lutetium-177m	71	10	Niobium-090	41	10
Lutetium-178	71	1000	Niobium-093m	41	100
Lutetium-178m	71	1000	Niobium-094	41	10
Lutetium-179	71	1000	Niobium-095	41	10
Magnesium-028	12	10	Niobium-095m	41	100
Manganese-051	25	1000	Niobium-096	41	10
Manganese-052	25	10	Niobium-097	41	100
Manganese-052m	25	1000	Niobium-098	41	1000
Manganese-053	25	1000	Osmium-180	76	1000
Manganese-054	25	10	Osmium-181	76	100
Manganese-056	25	100	Osmium-182	76	100
Mendelevium-257	101	100	Osmium-185	76	10
Mendelevium-258	101	1	Osmium-189m	76	1000
Mercury-193	80	100	Osmium-191	76	100
Mercury-193m	80	10	Osmium-191m	76	1000
Mercury-194	80	0.1	Osmium-193	76	100
Mercury-195	80	100	Osmium-194	76	1
Mercury-195m	80	100	Palladium-100	46	100
Mercury-197	80	1000	Palladium-101	46	100
Mercury-197m	80	1000	Palladium-103	46	100
Mercury-199m	80	1000	Palladium-107	46	100
Mercury-203	80	10	Palladium-109	46	1000
Molybdenum-090	42	100	Phosphorus-032	15	0.1
Molybdenum-093	42	100	Phosphorus-033	15	1
Molybdenum-093m	42	10	Platinum-186	78	100

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Radionuclide Name	Atomic Number	RQ (curies)
Platinum-188	78	100
Platinum-189	78	100
Platinum-191	78	100
Platinum-193	78	1000
Platinum-193m	78	100
Platinum-195m	78	100
Platinum-197	78	1000
Platinum-197m	78	1000
Platinum-199	78	1000
Platinum-200	78	100
Plutonium-234	94	1000
Plutonium-235	94	1000
Plutonium-236	94	0.1
Plutonium-237	94	1000
Plutonium-238	94	0.01
Plutonium-239	94	0.01
Plutonium-240	94	0.01
Plutonium-241	94	1
Plutonium-242	94	0.01
Plutonium-243	94	1000
Plutonium-244	94	0.01
Plutonium-245	94	100
Polonium-203	84	100
Polonium-205	84	100
Polonium-207	84	10
Polonium-210	84	0.01
Potassium-040	19	1
Potassium-042	19	100
Potassium-043	19	10
Potassium-044	19	100
Potassium-045	19	1000
Praseodymium-136	59	1000
Praseodymium-137	59	1000
Praseodymium-138m	59	100
Praseodymium-139	59	1000
Praseodymium-142	59	100
Praseodymium-142m	59	1000
Praseodymium-143	59	10
Praseodymium-144	59	1000
Praseodymium-145	59	1000
Praseodymium-147	59	1000
Promethium-141	61	1000
Promethium-143	61	100
Promethium-144	61	10
Promethium-145	61	100
Promethium-146	61	10
Promethium-147	61	10
Promethium-148	61	10
Promethium-148m	61	10
Promethium-149	61	100
Promethium-150	61	100
Promethium-151	61	100
Protactinium-227	91	100
Protactinium-228	91	10
Protactinium-230	91	10
Protactinium-231	91	0.01
Protactinium-232	91	10
Protactinium-233	91	100
Protactinium-234	91	10
Radium-223	88	1
Radium-224	88	10
Radium-225	88	1
Radium-226	88	0.1
Radium-227	88	1000
Radium-228	88	0.1
Radon-220	86	0.1
Radon-222	86	0.1
Rhenium-177	75	1000
Rhenium-178	75	1000
Rhenium-181	75	100
Rhenium-182 (12.7 hours)	75	10
Rhenium-182 (64.0 hours)	75	10
Rhenium-184	75	10
Rhenium-184m	75	10
Rhenium-186	75	100
Rhenium-186m	75	10
Rhenium-187	75	1000
Rhenium-188	75	1000
Rhenium-188m	75	1000
Rhenium-189	75	1000
Rhodium-099	45	10
Rhodium-099m	45	100
Rhodium-100	45	10
Rhodium-101	45	10
Rhodium-101m	45	100
Rhodium-102	45	10
Rhodium-102m	45	10
Rhodium-103m	45	1000
Rhodium-105	45	100
Rhodium-106m	45	10
Rhodium-107	45	1000
Rubidium-079	37	1000
Rubidium-081	37	100
Rubidium-081m	37	1000
Rubidium-082m	37	10
Rubidium-083	37	10
Rubidium-084	37	10
Rubidium-086	37	10
Rubidium-087	37	10
Rubidium-088	37	1000
Rubidium-089	37	1000
Ruthenium-094	44	1000
Ruthenium-097	44	100
Ruthenium-103	44	10
Ruthenium-105	44	100
Ruthenium-106	44	1
Samarium-141	62	1000
Samarium-141m	62	1000

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Radionuclide Name	Atomic Number	RQ (curies)	Radionuclide Name	Atomic Number	RQ (curies)
Samarium-142	62	1000	Tantalum-176	73	10
Samarium-145	62	100	Tantalum-177	73	1000
Samarium-146	62	0.01	Tantalum-178	73	1000
Samarium-147	62	0.01	Tantalum-179	73	1000
Samarium-151	62	10	Tantalum-180	73	100
Samarium-153	62	100	Tantalum-180m	73	1000
Samarium-155	62	1000	Tantalum-182	73	10
Samarium-156	62	100	Tantalum-182m	73	1000
Scandium-043	21	1000	Tantalum-183	73	100
Scandium-044	21	100	Tantalum-184	73	10
Scandium-044m	21	10	Tantalum-185	73	1000
Scandium-046	21	10	Tantalum-186	73	1000
Scandium-047	21	100	Technetium-093	43	100
Scandium-048	21	10	Technetium-093m	43	1000
Scandium-049	21	1000	Technetium-094	43	10
Selenium-070	34	1000	Technetium-094m	43	100
Selenium-073	34	10	Technetium-096	43	10
Selenium-073m	34	100	Technetium-096m	43	1000
Selenium-075	34	10	Technetium-097	43	100
Selenium-079	34	10	Technetium-097m	43	100
Selenium-081	34	1000	Technetium-098	43	10
Selenium-081m	34	1000	Technetium-099	43	10
Selenium-083	34	1000	Technetium-099m	43	100
Silicon-031	14	1000	Technetium-101	43	1000
Silicon-032	14	1	Technetium-104	43	1000
Silver-102	47	100	Tellurium-116	52	1000
Silver-103	47	1000	Tellurium-121	52	10
Silver-104	47	1000	Tellurium-121m	52	10
Silver-104m	47	1000	Tellurium-123	52	10
Silver-105	47	10	Tellurium-123m	52	10
Silver-106	47	1000	Tellurium-125m	52	10
Silver-106m	47	10	Tellurium-127	52	1000
Silver-108m	47	10	Tellurium-127m	52	10
Silver-110m	47	10	Tellurium-129	52	1000
Silver-111	47	10	Tellurium-129m	52	10
Silver-112	47	100	Tellurium-131	52	1000
Silver-115	47	1000	Tellurium-131m	52	10
Sodium-022	11	10	Tellurium-132	52	10
Sodium-024	11	10	Tellurium-133	52	1000
Strontium-080	38	100	Tellurium-133m	52	1000
Strontium-081	38	1000	Tellurium-134	52	1000
Strontium-083	38	100	Terbium-147	65	100
Strontium-085	38	10	Terbium-149	65	100
Strontium-085m	38	1000	Terbium-150	65	100
Strontium-087m	38	100	Terbium-151	65	10
Strontium-089	38	10	Terbium-153	65	100
Strontium-090	38	0.1	Terbium-154	65	10
Strontium-091	38	10	Terbium-155	65	100
Strontium-092	38	100	Terbium-156	65	10
Sulfur-035	16	1	Terbium-156m (24.4 hours)	65	1000
Tantalum-172	73	100	Terbium-156m (5.0 hours)	65	1000
Tantalum-173	73	100	Terbium-157	65	100
Tantalum-174	73	100	Terbium-158	65	10
Tantalum-175	73	100	Terbium-160	65	10

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Radionuclide Name	Atomic Number	RQ (curies)	Radionuclide Name	Atomic Number	RQ (curies)
Terbium-161	65	100	Uranium-233	92	0.1
Thallium-194	81	1000	Uranium-234	92	0.1
Thallium-194m	81	100	Uranium-235	92	0.1
Thallium-195	81	100	Uranium-236	92	0.1
Thallium-197	81	100	Uranium-237	92	100
Thallium-198	81	10	Uranium-238	92	0.1
Thallium-198m	81	100	Uranium-239	92	1000
Thallium-199	81	100	Uranium-240	92	1000
Thallium-200	81	10	Vanadium-047	23	1000
Thallium-201	81	1000	Vanadium-048	23	10
Thallium-202	81	10	Vanadium-049	23	1000
Thallium-204	81	10	Xenon-120	54	100
Thorium-226	90	100	Xenon-121	54	10
Thorium-227	90	1	Xenon-122	54	100
Thorium-228	90	0.01	Xenon-123	54	10
Thorium-229	90	0.001	Xenon-125	54	100
Thorium-230	90	0.01	Xenon-127	54	100
Thorium-231	90	100	Xenon-129m	54	1000
Thorium-232	90	0.001	Xenon-131m	54	1000
Thorium-234	90	100	Xenon-133	54	1000
Thulium-162	69	1000	Xenon-133m	54	1000
Thulium-166	69	10	Xenon-135	54	100
Thulium-167	69	100	Xenon-135m	54	10
Thulium-170	69	10	Xenon-138	54	10
Thulium-171	69	100	Ytterbium-162	70	1000
Thulium-172	69	100	Ytterbium-166	70	10
Thulium-173	69	100	Ytterbium-167	70	1000
Thulium-175	69	1000	Ytterbium-169	70	10
Tin-110	50	100	Ytterbium-175	70	100
Tin-111	50	1000	Ytterbium-177	70	1000
Tin-113	50	10	Ytterbium-178	70	1000
Tin-117m	50	100	Yttrium-086	39	10
Tin-119m	50	10	Yttrium-086m	39	1000
Tin-121	50	1000	Yttrium-087	39	10
Tin-121m	50	10	Yttrium-088	39	10
Tin-123	50	10	Yttrium-090	39	10
Tin-123m	50	1000	Yttrium-090m	39	100
Tin-125	50	10	Yttrium-091	39	10
Tin-126	50	1	Yttrium-091m	39	1000
Tin-127	50	100	Yttrium-092	39	100
Tin-128	50	1000	Yttrium-093	39	100
Titanium-044	22	1	Yttrium-094	39	1000
Titanium-045	22	1000	Yttrium-095	39	1000
Tungsten-176	74	1000	Zinc-062	30	100
Tungsten-177	74	100	Zinc-063	30	1000
Tungsten-178	74	100	Zinc-065	30	10
Tungsten-179	74	1000	Zinc-069	30	1000
Tungsten-181	74	100	Zinc-069m	30	100
Tungsten-185	74	10	Zinc-071m	30	100
Tungsten-187	74	100	Zinc-072	30	100
Tungsten-188	74	10	Zirconium-086	40	100
Uranium-230	92	1	Zirconium-088	40	10
Uranium-231	92	1000	Zirconium-089	40	100
Uranium-232	92	0.01	Zirconium-093	40	1

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Radionuclide Name	Atomic Number	RQ (curies)
Zirconium-095	40	10
Zirconium-097	40	10

NOTES: m - Signifies a nuclear isomer which is a radionuclide in a higher energy metastable state relative to the parent isotope.
Final RQs for all radionuclides apply to chemical compounds containing the radionuclides and elemental forms regardless of the diameter of pieces of solid material.

An adjusted RQ of one curie applies to all radionuclides not otherwise listed. Whenever the RQs in the SARA Title III Consolidated List and this list are in conflict, the lowest RQ applies.

Notification requirements for releases of mixtures or solutions of radionuclides can be found in 40 CFR section 302.6(b).

RCRA WASTE STREAMS AND UNLISTED HAZARDOUS WASTES
THE DESCRIPTIONS OF THE WASTE STREAMS HAVE BEEN TRUNCATED.
THIS LIST SHOULD BE USED FOR REFERENCE ONLY
COMPLIANCE INFORMATION CAN BE FOUND IN 40 CFR PART 302 AND TABLE 302.4

RCRA CODE	RQ	NAME
F001	10	The following spent halogenated solvents used in degreasing:
	100	(a) Tetrachloroethylene (CAS No. 127-18-4, RCRA Waste No. U210)
	100	(b) Trichloroethylene (CAS No. 79-01-6, RCRA Waste No. U228)
	1,000	(c) Methylene chloride (CAS No. 75-09-2, RCRA Waste No. U080)
	1,000	(d) 1,1,1-Trichloroethane (CAS No. 71-55-6, RCRA Waste No. U226)
	10	(e) Carbon tetrachloride (CAS No. 56-23-5, RCRA Waste No. U211)
	5,000	(f) Chlorinated fluorocarbons
F002	10	The following spent halogenated solvents:
	100	(a) Tetrachloroethylene (CAS No. 127-18-4, RCRA Waste No. U210)
	1,000	(b) Methylene chloride (CAS No. 75-09-2, RCRA Waste No. U080)
	100	(c) Trichloroethylene (CAS No. 79-01-6, RCRA Waste No. U228)
	1,000	(d) 1,1,1-Trichloroethane (CAS No. 71-55-6, RCRA Waste No. U226)
	100	(e) Chlorobenzene (CAS No. 108-90-7, RCRA Waste No. U037)
	5,000	(f) 1,1,2-Trichloro-1,2,2-trifluoroethane (CAS No. 76-13-1)
	100	(g) o-Dichlorobenzene (CAS No. 95-50-1, RCRA Waste No. U070)
	5,000	(h) Trichlorofluoromethane (CAS No. 75-69-4, RCRA Waste No. U121)
	100	(i) 1,1,2-Trichloroethane (CAS No. 79-00-5, RCRA Waste No. U227)
F003	100	The following spent non-halogenated solvents and still bottoms from recovery:
	1,000	(a) Xylene (CAS No. 1330-20-7, RCRA Waste No. U239)
	5,000	(b) Acetone (CAS No. 67-64-1, RCRA Waste No. U002)
	5,000	(c) Ethyl acetate (CAS No. 141-78-6, RCRA Waste No. U112)
	1,000	(d) Ethylbenzene (CAS No. 100-41-4)
	100	(e) Ethyl ether (CAS No. 60-29-7, RCRA Waste No. U117)
	5,000	(f) Methyl isobutyl ketone (CAS No. 108-10-1, RCRA Waste No. U161)
	5,000	(g) n-Butyl alcohol (CAS No. 71-36-3, RCRA Waste No. U031)
	5,000	(h) Cyclohexanone (CAS No. 108-94-1, RCRA Waste No. U057)
	5,000	(i) Methanol (CAS No. 67-56-1, RCRA Waste No. U154)
F004	100	The following spent non-halogenated solvents and still bottoms from recovery:
	100	(a) Cresols/cresylic acid (CAS No. 1319-77-3, RCRA Waste No. U052)
	1,000	(b) Nitrobenzene (CAS No. 98-95-3, RCRA Waste No. U169)
F005	100	The following spent non-halogenated solvents and still bottoms from recovery:
	1,000	(a) Toluene (CAS No. 108-88-3, RCRA Waste No. U220)
	5,000	(b) Methyl ethyl ketone (CAS No. 78-93-3, RCRA Waste No. U159)
	100	(c) Carbon disulfide (CAS No. 75-15-0, RCRA Waste No. P022)
	5,000	(d) Isobutanol (CAS No. 78-83-1, RCRA Waste No. U140)
	1,000	(e) Pyridine (CAS No. 110-86-1, RCRA Waste No. U196)
F006	10	Wastewater treatment sludges from electroplating operations (w/some exceptions)
F007	10	Spent cyanide plating bath solns. from electroplating
F008	10	Plating bath residues from electroplating where cyanides are used
F009	10	Spent stripping/cleaning bath solns. from electroplating where cyanides are used
F010	10	Quenching bath residues from metal heat treating where cyanides are used
F011	10	Spent cyanide soln. from salt bath pot cleaning from metal heat treating
F012	10	Quenching wastewater sludges from metal heat treating where cyanides are used
F019	10	Wastewater treatment sludges from chemical conversion aluminum coating

F020	1	Wastes from prod. or use of tri/tetrachlorophenol or derivative intermediates
F021	1	Wastes from prod. or use of pentachlorophenol or intermediates for derivatives
F022	1	Wastes from use of tetra/penta/hexachlorobenzenes under alkaline conditions
F023	1	Wastes from mat. prod. on equip. previously used for tri\tetrachlorophenol
F024	1	Wastes from production of chlorinated aliphatic hydrocarbons (C1-C5)
F025	1	Lights ends, filters from prod. of chlorinated aliphatic hydrocarbons (C1-C5)
F026	1	Waste from equipment previously used to prod. tetra/penta/hexachlorobenzenes
F027	1	Discarded formulations containing tri/tetra/pentachlorophenols or derivatives
F028	1	Residues from incineration of soil contaminated w/ F020,F021,F022,F023,F026,F027
F032	1	Wastewaters, process residuals from wood preserving using chlorophenolic solns.
F034	1	Wastewaters, process residuals from wood preserving using creosote formulations
F035	1	Wastewaters, process residuals from wood preserving using arsenic or chromium
F037	1	Petroleum refinery primary oil/water/solids separation sludge
F038	1	Petroleum refinery secondary (emulsified) oil/water/solids separation sludge
F039	1	Multisource leachate
K001	1	Wastewater treatment sludge from creosote/pentachlorophenol wood preserving
K002	10	Wastewater treatment sludge from prod. of chrome yellow and orange pigments
K003	10	Wastewater treatment sludge from prod. of molybdate orange pigments
K004	10	Wastewater treatment sludge from prod. of zinc yellow pigments
K005	10	Wastewater treatment sludge from prod. of chrome green pigments
K006	10	Wastewater treatment sludge from prod. of chrome oxide green pigments
K007	10	Wastewater treatment sludge from prod. of iron blue pigments
K008	10	Oven residue from prod. of chrome oxide green pigments
K009	10	Dist. bottoms from prod. of acetaldehyde from ethylene
K010	10	Dist. side cuts from prod. of acetaldehyde from ethylene
K011	10	Bottom stream from wastewater stripper in acrylonitrile prod.
K013	10	Bottom stream from acetonitrile column in acrylonitrile prod.
K014	5,000	Bottoms from acetonitrile purification column in acrylonitrile prod.
K015	10	Still bottoms from the dist. of benzyl chloride
K016	1	Heavy ends or dist. residues from prod. of carbon tetrachloride
K017	10	Heavy ends from the purification column in epichlorohydrin prod.
K018	1	Heavy ends from the fractionation column in ethyl chloride prod.
K019	1	Heavy ends from the dist. of ethylene dichloride during its prod.
K020	1	Heavy ends from the dist. of vinyl chloride during prod. of the monomer
K021	10	Aqueous spent antimony catalyst waste from fluoromethanes prod.
K022	1	Dist. bottom tars from prod. of phenol/acetone from cumene
K023	5,000	Dist. light ends from prod. of phthalic anhydride from naphthalene
K024	5,000	Dist. bottoms from prod. of phthalic anhydride from naphthalene
K025	10	Dist. bottoms from prod. of nitrobenzene by nitration of benzene
K026	1,000	Stripping still tails from the prod. of methyl ethyl pyridines
K027	10	Centrifuge/dist. residues from toluene diisocyanate prod.
K028	1	Spent catalyst from hydrochlorinator reactor in prod. of 1,1,1-trichloroethane
K029	1	Waste from product steam stripper in prod. of 1,1,1-trichloroethane
K030	1	Column bottoms/heavy ends from prod. of trichloroethylene and perchloroethylene
K031	1	By-product salts generated in the prod. of MSMA and cacodylic acid
K032	10	Wastewater treatment sludge from the prod. of chlordane
K033	10	Wastewaster/scrubwater from chlorination of cyclopentadiene in chlordane prod.
K034	10	Filter solids from filtration of hexachlorocyclopentadiene in chlordane prod.
K035	1	Wastewater treatment sludges from the prod. of creosote
K036	1	Still bottoms from toluene reclamation distillation in disulfoton prod.

K037	1	Wastewater treatment sludges from the prod. of disulfoton
K038	10	Wastewater from the washing and stripping of phorate production
K039	10	Filter cake from filtration of diethylphosphorodithioic adid in phorate prod.
K040	10	Wastewater treatment sludge from the prod. of phorate
K041	1	Wastewater treatment sludge from the prod. of toxaphene
K042	10	Heavy ends/residues from dist. of tetrachlorobenzene in 2,4,5-T prod.
K043	10	2,6-Dichlorophenol waste from the prod. of 2,4-D
K044	10	Wastewater treatment sludge from manuf. and processing of explosives
K045	10	Spent carbon from treatment of wastewater containing explosives
K046	10	Wastewater sludge from manuf.,formulating,loading of lead-based initiating compd
K047	10	Pink/red water from TNT operations
K048	10	Dissolved air flotation (DAF) float from the petroleum refining industry
K049	10	Slop oil emulsion solids from the petroleum refining industry
K050	10	Heat exchanger bundle cleaning sludge from petroleum refining industry
K051	10	API separator sludge from the petroleum refining industry
K052	10	Tank bottoms (leaded) from the petroleum refining industry
K060	1	Ammonia still lime sludge from coking operations
K061	10	Emission control dust/sludge from primary prod. of steel in electric furnaces
K062	10	Spent pickle liquor generated by steel finishing (SIC codes 331 and 332)
K064	10	Acid plant blowdown slurry/sludge from blowdown slurry from primary copper prod.
K065	10	Surface impoundment solids at primary lead smelting facilities
K066	10	Sludge from treatment of wastewater/acid plant blowdown from primary zinc prod.
K069	10	Emission control dust/sludge from secondary lead smelting
K071	1	Brine purification muds from mercury cell process in chlorine production
K073	10	Chlorinated hydrocarbon waste from diaphragm cell process in chlorine production
K083	100	Distillation bottoms from aniline extraction
K084	1	Wastewater sludges from prod. of veterinary pharm. from arsenic compds.
K085	10	Distillation or fractionation column bottoms in prod. of chlorobenzenes
K086	10	Wastes/sludges from prod. of inks from chromium and lead-containing substances
K087	100	Decanter tank tar sludge from coking operations
K088	10	Spent potliners from primary aluminum reduction
K090	10	Emission control dust/sludge from ferrochromiumsilicon prod.
K091	10	Emission control dust/sludge from ferrochromium prod.
K093	5,000	Dist. light ends from prod. of phthalic anhydride by ortho-xylene
K094	5,000	Dist. bottoms in prod. of phthalic anhydride by ortho-xylene
K095	100	Distillation bottoms in prod. of 1,1,1-trichloroethane
K096	100	Heavy ends from dist. column in prod. of 1,1,1-trichloroethane
K097	1	Vacuum stripper discharge from the chlordane chlorinator in prod. of chlordane
K098	1	Untreated process wastewater from the prod. of toxaphene
K099	10	Untreated wastewater from the prod. of 2,4-D
K100	10	Waste leaching soln from emission control dust/sludge in secondary lead smelting
K101	1	Dist. tar residue from aniline in prod. of veterinary pharm. from arsenic compd.
K102	1	Residue from activated carbon in prod. of veterinary pharm. from arsenic compds.
K103	100	Process residues from aniline extraction from the prod. of aniline
K104	10	Combined wastewater streams generated from prod. of nitrobenzene/aniline
K105	10	Aqueous stream from washing in prod. of chlorobenzenes
K106	1	Wastewater treatment sludge from mercury cell process in chlorine prod.
K107	10	Column bottoms from separation in prod. of UDMH from carboxylic acid hydrazides
K108	10	Condensed column overheads and vent gas from prod. of UDMH from -COOH hydrazides
K109	10	Spent filter catridges from purif. of UDMH prod. from carboxylic acid hydrazides

K110	10	Condensed column overheads from separation in UDMH prod. from -COOH hydrazides
K111	10	Product washwaters from prod. of dinitrotoluene via nitration of toluene
K112	10	Reaction by-product water from drying in toluenediamine prod from dinitrotoluene
K113	10	Condensed liquid light ends from purification of toluenediamine during its prod.
K114	10	Vicinals from purification of toluenediamine during its prod from dinitrotoluene
K115	10	Heavy ends from toluenediamine purification during prod. from dinitrotoluene
K116	10	Organic condensate from solvent recovery system in prod. of toluene diisocyanate
K117	1	Wastewater from vent gas scrubber in ethylene bromide prod by ethene bromination
K118	1	Spent absorbent solids in purification of ethylene dibromide in its prod.
K123	10	Process waterwater from the prod. of ethylenebisdithiocarbamic acid and salts
K124	10	Reactor vent scubber water from prod of ethylenebisdithiocarbamic acid and salts
K125	10	Filtration/other solids from prod. of ethylenebisdithiocarbamic acid and salts
K126	10	Dust/sweepings from the prod. of ethylenebisdithiocarbamic acid and salts
K131	100	Wastewater and spent sulfuric acid from the prod. of methyl bromide
K132	1,000	Spent absorbent and wastewater solids from the prod. of methyl bromide
K136	1	Still bottoms from ethylene dibromide purif. in prod. by ethene bromination
K141	1	Process residues from coal tar recovery in coking
K142	1	Tar storage tank residues from coke prod. from coal or recovery of coke by-prods
K143	1	Process residues from recovery of light oil in coking
K144	1	Wastewater residues from light oil refining in coking
K145	1	Residues from naphthalene collection and recovery from coke by-products
K147	1	Tar storage tank residues from coal tar refining in coking
K148	1	Residues from coal tar distillation, including still bottoms, in coking
K149	10	Distillation bottoms from the prod. of chlorinated toluenes/benzoyl chlorides
K150	10	Organic residuals from Cl gas and HCl recovery from chlorinated toluene prod.
K151	10	Wastewater treatment sludge from production of chlorotoluenes/benzoyl chlorides
K156	1*	Organic waste from production of carbamates and carbamoyl oximes
K157	1*	Wastewaters from production of carbamates and carbamoyl oximes (not sludges)
K158	1*	Bag house dusts & filter/separation solids from prod of carbamates, carb oximes
K159	1*	Organics from treatment of thiocarbamate waste
K161	1*	Purif. solids/bag house dust/sweepings from prod of dithiocarbamate acids/salts
K169	10	Crude oil storage tank sediment from refining operations
K170	1	Clarified slurry oil tank sediment of in-line filter/separation solids
K171	1	Spent hydrotreating catalyst
K172	1	Spent hydrorefining catalyst
K174	1	Wastewater treatment sludges from the production of ethylene dichloride or vinyl chloride monomer (EDC/VCM)
K175	1	Wastewater treatment sludges from the production vinyl chloride monomer using mercuric chloride catalyst in an acetlyene-based process
D001	100	Unlisted hazardous wastes characteristic of ignitability
D002	100	Unlisted hazardous wastes characteristic of corrosivity
D003	100	Unlisted hazardous wastes characteristic of reactivity
		Unlisted hazardous wastes characteristic of toxicity:
D004	1	Arsenic
D005	1,000	Barium
D006	10	Cadmium
D007	10	Chromium
D008	10	Lead
D009	1	Mercury
D010	10	Selenium

D011	1	Silver
D012	1	Endrin
D013	1	Lindane
D014	1	Methoxychlor
D015	1	Toxaphene
D016	100	2,4-D
D017	100	2,4,5-TP
D018	10	Benzene
D019	10	Carbon tetrachloride
D020	1	Chlordane
D021	100	Chlorobenzene
D022	10	Chloroform
D023	100	o-Cresol
D024	100	m-Cresol
D025	100	p-Cresol
D026	100	Cresol
D027	100	1,4-Dichlorobenzene
D028	100	1,2-Dichloroethane
D029	100	1,1-Dichloroethylene
D030	10	2,4-Dinitrotoluene
D031	1	Heptachlor (and epoxide)
D032	10	Hexachlorobenzene
D033	1	Hexachlorobutadiene
D034	100	Hexachloroethane
D035	5,000	Methyl ethyl ketone
D036	1,000	Nitrobenzene
D037	10	Pentachlorophenol
D038	1,000	Pyridine
D039	100	Tetrachloroethylene
D040	100	Trichloroethylene
D041	10	2,4,5-Trichlorophenol
D042	10	2,4,6-Trichlorophenol
D043	1	Vinyl chloride

United States
Environmental Protection
Agency

Solid Waste
and Emergency Response
(5305W)

EPA530-F-96-032
June 1996

EPA

Hazardous Waste Requirements for Large Quantity Generators

If you are a Large Quantity Generator (LQG) of hazardous waste, you must comply with the full set of federal hazardous waste regulations. You are considered an LQG if you generate more than 2,200 lbs (1,000 kg) of hazardous waste or more than 2.2 lbs (1 kg) of acute hazardous waste per calendar month. To assist your business in learning about these requirements, the U.S. Environmental Protection Agency (EPA) has prepared this summary fact sheet. **This is only a summary and does not include all of the LQG requirements.**

For more information, call the RCRA Hotline at 800 424-9346 or TDD 800 553-7672 (hearing impaired). Callers in the Washington, D.C., metropolitan area may dial 703 412-9810 or TDD 703 412-3323. Additionally, you can refer to Title 40 of the *Code of Federal Regulations* Part 262 (40 CFR Part 262) or EPA's handbook, *Understanding Hazardous Waste Rules: A Handbook for Small Businesses—1996 Update* (EPA document number 530-K-95-001), for a more detailed discussion of some of these issues. Be sure to check with your state hazardous waste agency as well, as some states have additional or more stringent requirements than the federal government.

Identifying the Hazardous Wastes You Generate

40 CFR 262.10 and Part 268

You must determine if any of the solid wastes you generate are hazardous so that you will be able to manage, report, and track them properly. Hazardous wastes can be:

- **Listed wastes.** These wastes will appear on one of four lists published in 40 CFR Part 261.
- **Characteristic wastes.** Certain wastes are considered hazardous if they are ignitable, corrosive, reactive, or toxic.

To determine if your wastes exhibit a characteristic, you may use EPA-approved test methods or apply your knowledge of the waste. If waste is to be land disposed, you must determine if your wastes exhibit any characteristics, even if they are listed wastes. Under the Land Disposal Restrictions (LDRs), most hazardous wastes may not be land disposed until they meet "treatment standards." It is your responsibility to ensure that your waste is treated to these standards. To learn about these requirements, call the RCRA Hotline or your state agencies or Regional Office.

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Determining Your Generator Category

40 CFR 262.10(b) and 261.5(b) and (c)

If you are not sure if you are an LQG, you should measure the amount of hazardous waste you generate per calendar month. Be sure to measure wastes that are:

- Accumulated on site for any time before disposal or recycling.
- Placed directly into an on-site treatment or disposal unit.
- Generated as still bottoms or sludges and removed from product storage tanks.

Obtaining an EPA Identification Number

40 CFR 262.12

Identification numbers are required for persons that generate or manage hazardous waste, including small and large quantity generators, transporters, and treatment, storage, and disposal facilities. You will need an EPA identification number for each site that generates hazardous waste.

To find out where to call to obtain an identification number, contact the RCRA Hotline. Once you have contacted the proper authority, you will be sent EPA Form 8700-12, Notification of Regulated Waste Activity. Fill out the form and send it to the contact listed with the form. An EPA identification number will be returned to you for each location.

Preparing Hazardous Waste for Shipment Off Site

40 CFR 262.30—262.33

You must package, label, and mark your waste containers and placard vehicles that carry the wastes, following Department of Transportation (DOT) Hazardous Materials Transportation Act requirements (49 CFR Parts 172, 173, 178, and 179). Commercial waste handlers can advise you on the proper procedure, but you remain responsible for compliance.

For further information, call the DOT Hazardous Materials Information Line at 202 366-4488.

Obtaining a Manifest

40 CFR 262.20—262.23, 262.42

A hazardous waste manifest must accompany all hazardous waste that is shipped off site. A manifest is a multipart form designed to track hazardous waste from the time it leaves the generation site until it reaches the TSDF specified on the manifest. The manifest will help you to track your waste during shipment and make sure it arrives at the proper destination.

You should use the manifest form from the destination state. If the destination state does not print the manifest form, then use one from the state of origin or another source, if the state of origin does not print the manifest. The federal form is the Uniform Hazardous Waste Manifest (EPA Form 8700-22). The transporter and the permitted facility that treats or disposes of your waste must sign the manifest and send a copy back to you.

Managing Hazardous Waste On Site

40 CFR 262.34

You may accumulate any quantity of waste in containers, tanks, drip pads, and containment buildings for up to 90 days without a permit, provided that you meet the technical standards for the containment unit. LQGs that meet all technical standards for hazardous waste accumulation also may treat the waste without obtaining a RCRA permit. Generators must clearly mark the date that accumulation begins on each container storing hazardous waste so that it is visible for inspection.

LQGs are also responsible for complying with "preparedness and prevention" requirements in the event of emergencies. In addition, you must prepare a written contingency plan and train employees on hazardous waste management and emergency response.

If your facility accumulates wastes for more than 90 days, it is considered a storage facility and must follow regulations described in 40 CFR Parts 264 and 270, unless you have been granted an extension by your EPA Regional Administrator.

Reporting

40 CFR 262.41—262.43

Biennial Reporting

You are responsible for submitting a Biennial Report to your EPA Regional Office. Reports submitted for offsite shipping must include your EPA identification number, information for the transporter and permitted facility, a description and quantity of waste, actions you have taken to reduce the volume and toxicity of the waste, and the results of those actions. These reports give EPA a better understanding of national hazardous waste generation and disposal. They can also be used to promote pollution prevention. Some states might require you to report annually.

If you only export hazardous wastes, you are not required to submit a Biennial Report. You do, however, have to submit an annual report (40 CFR 262.56). Call the RCRA Hotline for more information.

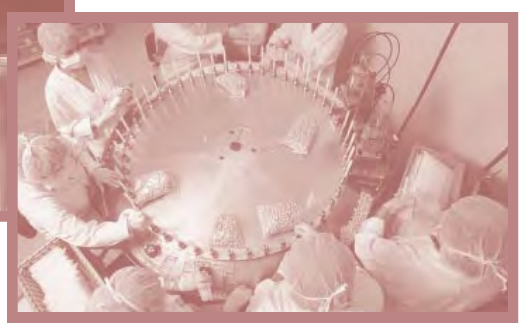
Exception Reporting

If you do not receive a signed manifest from the final destination of your hazardous waste:

- After 35 days, you must attempt to locate the hazardous waste by contacting the permitted facility.
- After 45 days, you must submit to your EPA Regional Office an Exception Report that contains a copy of the original manifest and a cover letter describing your efforts to locate the shipment and the results of your efforts.

Recordkeeping
40 CFR 262.40

Be sure to retain the following records at the facility for at least 3 years: signed manifests, biennial and exception reports, test results, and waste analyses. The 3-year period is automatically extended during the course of any unresolved enforcement actions.



Complying with Land Disposal Restrictions
40 CFR Part 268

Wastes must meet certain treatment standards prior to land disposal. When you transport your waste to a treatment facility, you must send a notice informing the facility that the waste does not yet meet treatment standards. The notice should contain enough information about the waste and the applicable standards so that the facility can make sure that the appropriate standards are met before disposal. A certification is required in some situations. You can contact the RCRA Hotline, your state agency, or EPA Regional office for help with notification and certification requirements. If you treat your waste on site, you must maintain a waste analysis plan.

Export/Import Requirements
40 CFR Part 262, Subpart E

If you plan to export hazardous wastes, you will have to notify EPA 60 days before the intended date of shipment to obtain written consent. Also, EPA's "Acknowledgement of Consent" document, which is filled out by the receiving country, must accompany the shipment at all times.

Hazardous waste management facilities receiving waste from a foreign source must notify the EPA Regional office of the shipment at least four weeks before receiving it. Importers of hazardous waste must be U.S. citizens and must certify that the shipment is in compliance with all applicable rules under the Toxic Substances Control Act (TSCA). For more information on TSCA, call EPA's TSCA Assistance Hotline at 202 554-1404 or TDD 202 554-0551.

EPA

United States Environmental Protection Agency
401 M Street, SW. (5305W)
Washington, DC 20460

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Introduction

The purpose of this manual is to help hospitals start mercury pollution prevention programs or accelerate programs that have already begun. New federal regulations greatly reduce the amount of mercury that is allowed to be discharged from a municipal wastewater system or an incinerator. By implementing the *best management practices* described in this manual, you can reduce the level of mercury in the environment and avoid the need for increased regulations in the years to come.

The manual offers general guidance on how to initiate a program and technical guidance for implementing the program. The manual includes:

- Information about mercury and its impact on people and the environment (Chapter 1)
- Overview of pollution prevention strategies (Chapter 1)
- How to start a mercury pollution prevention program in your hospital (Chapter 2)
- How to monitor your program, educate staff and measure success (Chapter 2)
- Alternatives for mercury-containing products (Chapter 3)
- Best management practices for handling, recycling and disposing of mercury-containing products still in use (Chapter 3)
- Contacts for further information, case studies and other information (Appendices)

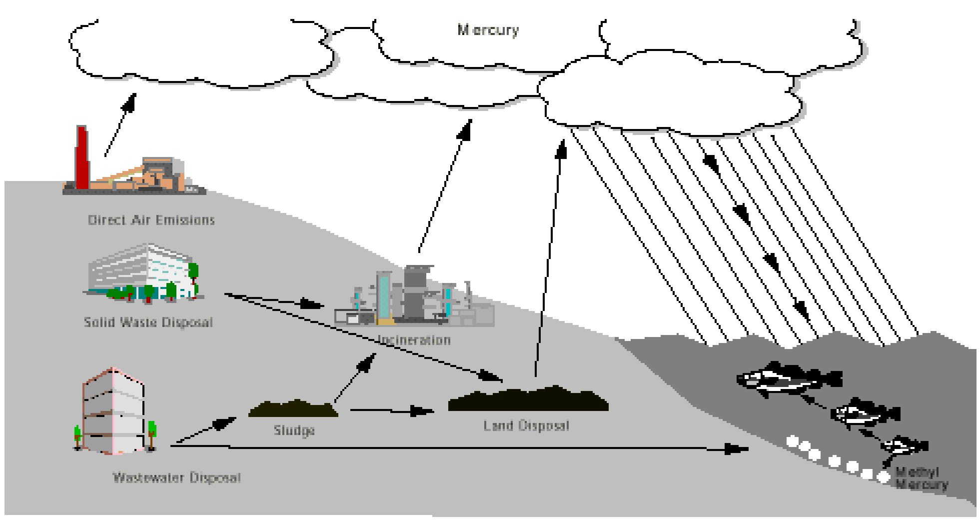
Background on Mercury

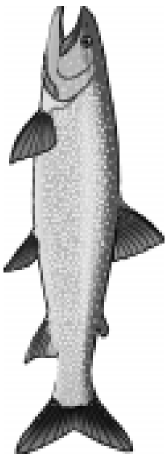
Mercury is a toxic metal that occurs naturally in the environment. There are both inorganic forms and organic forms of mercury. Many of the forms of mercury circulate in the environment, moving from land or water to air and back again, and the forms of mercury may change from one to another as they circulate.

Human activities significantly redistribute mercury and release it into the environment. They allow mercury that was formerly unavailable to the *biosphere** to be mobilized and carried to new areas via air and water. In the water or soil, microorganisms can convert inorganic mercury into a more toxic organic form, methylmercury. Fish take in methylmercury from their diet and from water passing over their gills. They *bioaccumulate* the methylmercury in their bodies because the rate of intake of methylmercury is much greater than its elimination. Methylmercury bioaccumulates in the tissues of a fish throughout its lifetime. It can build up to high levels in predator fish at the top of the aquatic food chain – levels that are tens of thousands to millions of times above the level found in the surrounding water. Fish with high levels of methylmercury may be caught and consumed by humans, waterfowl or other wildlife.

* *Words in italics are defined in the Glossary (Appendix Q).*

Figure 1. Mercury Transport and Bioaccumulation





Health Impacts of Mercury Exposure

All forms of mercury are toxic to humans, but the various forms of organic and inorganic mercury have different toxicity. Generally, organic forms are much more toxic than inorganic forms.

The organic forms of mercury are primarily neurotoxins. Therefore exposure can damage the brain and nervous system. The developing brain of a fetus or child is especially vulnerable to organic mercury exposure. Inorganic forms of mercury primarily affect the kidney, but are also neurotoxins. Other organs and systems of the body can be harmed by exposure to mercury.

A human can be exposed to mercury via all three routes of exposure: inhalation, ingestion, and dermal. The most likely routes of exposure are inhalation of inorganic mercury vapor after a spill or during a manufacturing process, or ingestion of methylmercury from contaminated fish. The fetus of a mother who eats contaminated fish can be exposed to methylmercury via the mother's blood, and an infant can be exposed by ingestion of breast milk. Mercury cannot be removed from fish before they are eaten because methylmercury accumulates in the muscle, not the fat. Most of the states in the U.S., including New York State, issue cautionary advisories about eating the fish caught in some of their waterways because of the presence of mercury. These advisories represent conservative measures to protect human health.

Mercury in Medical Facilities

The following lists show some of the common uses of mercury that may be found in hospitals.

Medical uses:

- Thermometers
- Sphygmomanometers (blood pressure monitors)
- Esophageal dilators (also called bougie tubes)
- Cantor tubes and Miller Abbott tubes (used to clear intestinal obstructions)
- Feeding tubes
- Dental amalgam
- Laboratory chemicals (fixatives, stains, reagents, preservatives)
- Medical batteries

Nonmedical uses common in medical settings:

- Cleaning solutions with caustic soda or chlorine that were contaminated with mercury during the production process
- Batteries
- Fluorescent lamps and high-intensity lamps
- Non-electronic thermostats
- Pressure gauges
- Some electrical switches used for lights and appliances

More complete lists can be found in *Appendix A* and *Appendix B*. There is minimal risk of mercury exposure during normal use of products that are handled correctly. However, problems may occur if the mercury in a product is exposed to air, or if a product is not properly discarded so as to keep mercury out of the environment.

Mercury Pollution Prevention

Concerns about the health impacts of mercury are leading to mercury *pollution prevention* programs at the federal, state and local levels. The highest priority of any pollution prevention program is *source reduction,* which means not using mercury in the first place. For example, some states have banned the deliberate use of mercury in certain products for which alternatives are available.

When adequate mercury alternatives are not available and mercury must be used, it may be possible to recycle it. Recycling is the second priority of mercury pollution prevention. Disposal of mercury should be the last resort. It is expensive and increases the potential of mercury being dispersed into the environment.

Pollution prevention programs are driven by voluntary efforts and by increasingly strict federal and state regulations. Some of the regulations govern occupational exposures and waste disposal. Other regulations result from the federal Clean Air Act Amendments of 1990. The 1995 federal Great Lakes Water

Quality Guidance (also referred to as the Great Lakes Initiative) sets strict water quality standards for mercury in the eight Great Lakes States. (For contacts for regulatory information, see *Appendix C*.)

Best Management Practices (BMPs) for the management of mercury within hospitals might involve:

- Use of alternatives for products that contain mercury
- Recycling of mercury-containing products when they can no longer be used
- Correct handling and disposal of mercury, mercury-containing equipment and laboratory chemicals
- Proper cleanup of spills involving mercury
- Hospital policies that support BMPs

The BMPs are intended to result in the greatest reduction in mercury discharge to the environment that is currently feasible for hospitals.

Benefits of Mercury Pollution Prevention

Mercury pollution prevention in the hospital provides many benefits:

- Protection of human health and wildlife by reducing occupational exposures and releases of mercury to the air, water and land from wastewater discharges, spills, landfilling or incineration
- Avoidance of the costs associated with the use of mercury, such as disposal or recycling, collection and storage prior to disposal, paper work for tracking hazardous waste disposal, training and equipment for spill response, training for hospital employees who handle mercury-containing products, and liability for environmental problems or worker exposure
- Avoidance of increased regulation in the future
- Increase in the public's awareness about the dangers of mercury through publicity about the hospital's program
- Enhancement of the positive public image of the medical facility due to publicity about success stories

How to Establish Mercury Pollution Prevention in Your Hospital

Get Started

(See the flow chart on the following page that corresponds with this section.)

Get support from the top

Support from the hospital's Chief Executive Officer (CEO) is one critical factor in ensuring the success of a mercury pollution prevention program. A first step should be to communicate with the CEO on the benefits of such a program and to request support. A partial listing of program benefits to use in communicating with the CEO is shown in *Appendix D*. When communicating with the CEO, it is important to be clear how the CEO can help. CEO designation of highly respected, knowledgeable individuals to be responsible for policy and operational leadership roles is one important action for the CEO.

Identify and involve staff

The CEO should designate one or more project leaders, including:

- A person to be responsible for developing mercury pollution prevention policy and confirming implementation. The CEO may choose to accept this role or may designate another who is familiar with the workings of the entire hospital and the procedures for approval of policy.
- A person to be responsible for implementing the program. This should be a mercury pollution prevention "champion" who will be enthusiastic about the program and will be dedicated to it. He or she may well be the one who proposed mercury pollution prevention in the first place and who approached the hospital's administration about it. The implementor is often a staff member who is involved in hazardous waste and medical waste management as part of his or her job.

Because mercury appears in so many different locations in a hospital, it takes a team effort to reduce or eliminate its use. The project leaders described above should select a contact from each department who will help to build support for the program and who has the authority to make changes in the department. It may be time-efficient to hold a "kick-off" meeting to introduce the mercury pollution prevention program. However, it would not be necessary to hold meetings as long as the program leaders effectively communicate the objectives of the program to each person who will be involved, and maintain communication until the mercury pollution prevention program has reached its goal.

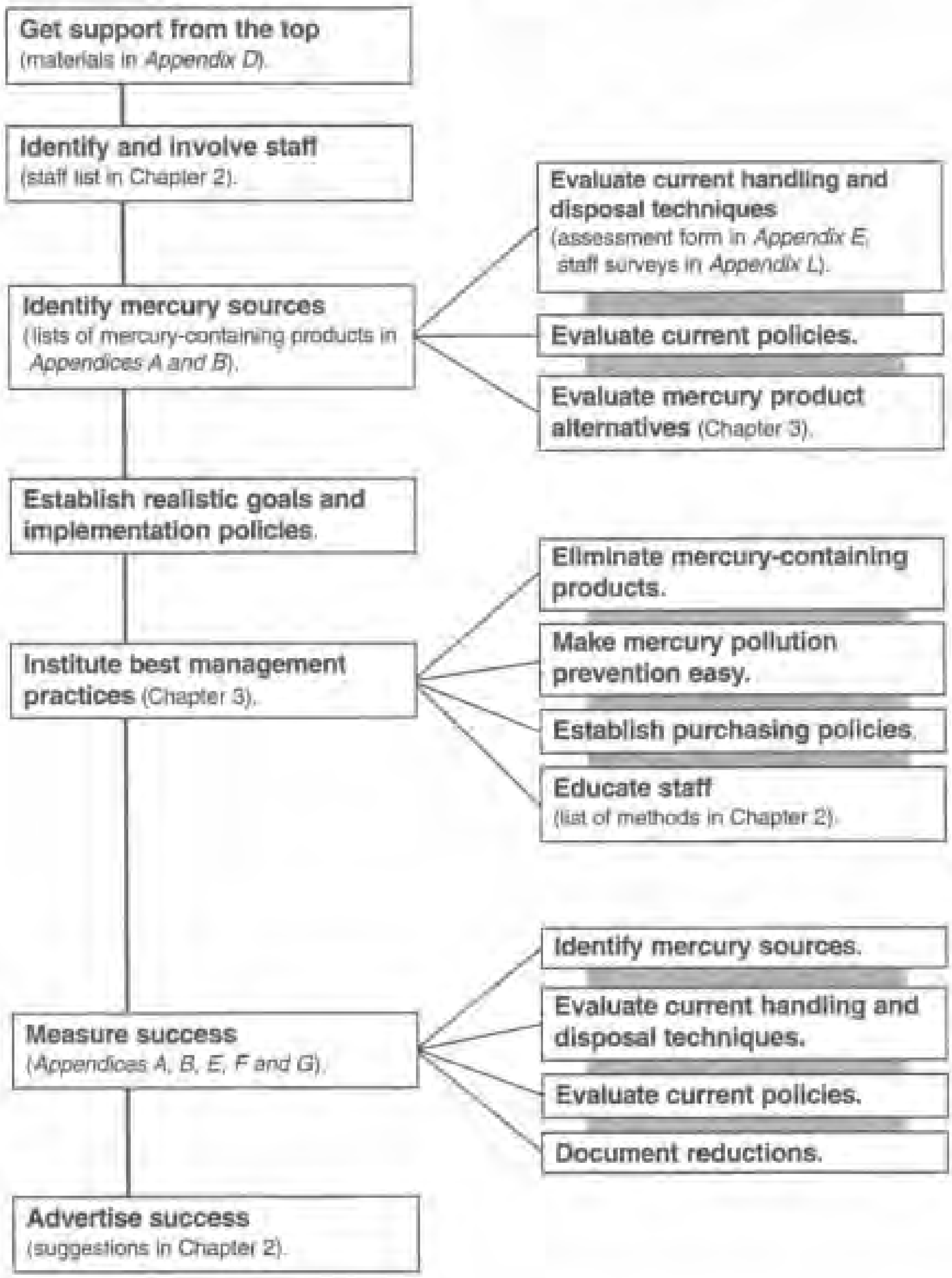
Staff persons that should be directly involved are those with the following functions:

Administrator/policy leader
Safety officer
Champion/implementor
Purchasing officer
Nurse
In-service educator/trainer
Laboratory manager
Maintenance/facilities manager
Engineer
Housekeeping manager
Hazardous waste management coordinator
Supply manager

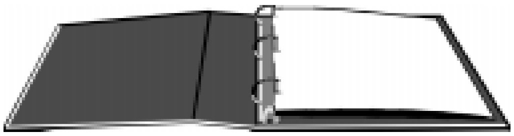
(Note that titles of hospital personnel vary considerably from hospital to hospital.)

All employees of the hospital need to be informed about the program, including employees at off-site locations.

Figure 2. How to Establish Mercury Pollution Prevention in Your Hospital



Gather Data



Identify mercury sources

The first task of the implementor is to create a baseline assessment from which progress can be measured. The department contacts should assist in this effort. Use the checklist of possible mercury-containing products (see *Appendix A*) and/or the checklist of categories of possible mercury-containing laboratory chemicals (see *Appendix B*) as guidelines. The department contacts should perform an audit of all uses and sources of mercury in their own departments.

Evaluate current handling and disposal techniques

The program implementor, with the assistance of department contacts, should assess the status of current hospital practices for handling mercury and staff knowledge about mercury sources and spill prevention and management. (See *Appendix E* for a form for recording your hospital's baseline assessment and four yearly updates.)

If possible, wastewater sample results should be included in the baseline assessment. If the hospital does not currently sample wastewater, work with the hospital's wastewater regulator to learn what data is available or may be collected. Total discharges of mercury in pounds should be calculated. Total discharges are a better indicator of the hospital's impact on the environment than concentration. (See *Appendix F* for further information.)

Evaluate current policies

Department contacts can help to consolidate the hospital's policies that pertain to mercury such as:

- Handling of mercury-containing products
- Mercury spill management
- Recycling or disposal of mercury-containing products
- Purchase of alternatives to mercury-containing products

Policies that address hazardous materials management and laboratory chemical management may be pertinent to mercury, even though mercury may not be mentioned specifically. Hospital policies may be collected by either of the two project leaders.

Evaluate mercury product alternatives

Use the information in Chapter 3 to learn more about mercury-free substitutes for the mercury sources noted on your baseline assessment. Hospital suppliers can also assist you in finding mercury-free alternatives.

Questions to ask when comparing a mercury-containing product and a mercury-free substitute include:

- Is the performance of the substitute as good as the mercury-containing product?
- If the performance is not as good, is it adequate for the purpose?
- What are the costs for purchase? For calibration (if applicable)? For accessories? For maintenance? For disposal?
- Is added cost offset by lower handling, disposal and liability costs?
- Does the substitute introduce new problems for maintenance, handling or disposal?

(For examples of cost/savings worksheets, see *Appendix G*.)

Once a decision has been made to introduce a substitute, it can be decided how to implement the substitution. Some hospitals replace mercury-containing products all at once. Some make substitutions gradually, replacing mercury-containing products when they become unusable.

Establish Realistic Goals and Implementation Plans

The long-term goal of the hospital may be to eliminate the use of mercury entirely. This is true pollution prevention. It will be easier and more satisfying to measure success if the hospital also develops short-term goals, such as eliminating the use of mercury sphygmomanometers within two years. The project leaders should get the support of the CEO for the goals and create a comprehensive plan that lays out how the hospital will achieve its mercury-free status. Contacts from the departments should be key players in establishing the plan. Key components of the plan could include:

- Best management practices (see Chapter 3)
- Policies for the medical departments, the purchasing department and the waste management department
- Training and continuing education programs for staff and administrators
- A process to review progress regularly

Institute Best Management Practices

Obtain the CEO's stamp of approval for all of the best management practices that are selected to become part of the hospital's mercury pollution prevention program.

Eliminate mercury-containing products

The highest priority of the pollution prevention program is the elimination of mercury. The hospital should phase-in alternatives if evaluation has demonstrated them to be acceptable and cost-effective (taking into account disposal costs).

Make mercury pollution prevention easy

Chapter 3 of this manual describes best management practices to keep mercury out of the environment. The chapter is organized by product (thermometers, laboratory chemicals, electrical equipment, etc.).

The hospital can make proper disposal easy by creating convenient locations for disposal of mercury products, as well as other hazardous materials. Establish an internal "take-back" program for electrical equipment by placing a collection box for old equipment at the point where the new equipment is picked up. Find a way to label mercury-containing products so that each user is aware of his or her responsibility for proper use and disposal.

Establish purchasing policies

Consider a policy that bans the purchase of any mercury-containing item if an adequate alternative exists. The policy could include a requirement for specific authorization by the hospital CEO or other designated official for the purchase of a mercury product. Authorize the purchasing department to make "mercury-free" a part of product specifications, to insist on mercury disclosures on all products coming into the hospital, to specify the use of recovered mercury in all products that do not yet have mercury-free alternatives, and to include disposal costs in cost evaluations.

It is becoming a competitive issue for vendors to ensure that their products do not create unnecessary waste or that they are made from recycled materials. Your vendors need to know that mercury-free alternative products are required by your hospital. Ask them to verify in writing that their products are mercury-free or that they will assist you in selecting mercury-free products. For laboratory chemicals, a Certificate of Analysis can be requested. See *Appendix H* for a sample letter requesting mercury information and a sample Certificate of Analysis. For other products, a vendor product mercury-content disclosure can be requested (see *Appendix I*).

Investigate opportunities for reduction in the cost of mercury-free products or reduction in recycling costs through group purchasing of products and services with other hospitals or clinics.

Educate staff

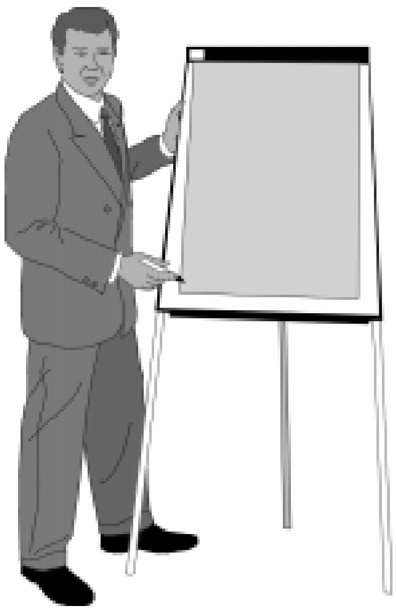
Employee education in mercury pollution prevention is an important component of successful programs. Determine which groups within the hospital need instruction and identify the most important topics for each group. Each segment of the training program should be adapted for the educational level of the group being trained and the intensity of training needed.

Try to incorporate mercury pollution prevention into existing training programs such as new employee orientation, safety training, right-to-know training, department meetings and grand rounds. Training should be continued on an annual basis until mercury-containing products are eliminated from the hospital.

Educational methods include:

- Train-the-trainer program
- Presentations at meetings

- Display in cafeteria or other common area
- Survey about mercury awareness
- Articles in hospital newsletter and other existing publications
- Distribution of articles from professional journals or newsletters
- Employee handbook page on the guidelines for handling and disposing of mercury
- Paycheck enclosure
- Recycling guide
- Posters, fliers and stickers
- Signs near red bags, sharps containers and sinks, and in supply areas and disposal areas
- Labels on instruments that use mercury materials



- Video
- E-Mail
- Verbal instruction from supervisors and from medical engineers who work throughout the hospital
- Incentive program to reward workers with good ideas that make mercury pollution prevention easier
- Reports on internal audits

(See list of Educational Resources for a Mercury Pollution Prevention Program in *Appendix J*.)

Measure and Document Success

Evaluate the status of the mercury pollution prevention program

Measurement of success is a vital component of pollution prevention that allows the hospital staff and the community to realize the effectiveness of the program. Start by repeating the mercury source identification that was done at the beginning of the program (see *Appendix E*), using the checklist of possible mercury-containing products in *Appendix A* and *Appendix B*. If it is not practical to repeat every measurement, select a few good indicators from the table to track from year to year. If possible, take wastewater samples or have them taken by an independent testing laboratory so that the total mercury discharge can be calculated and compared with the baseline assessment.

Note the sources and quantities of mercury that have been eliminated. Compute the costs or savings to the hospital of the substitution of mercury-free products purchased since the baseline assessment (see *Appendix G*). Quantify and document new policies or changes to former policies since the baseline assessment if they are related to mercury pollution prevention.

The hospital should realize a reduction in:

- Mercury products purchased, used and stored
- Mercury spill incidents
- Quantity of mercury shipped off-site for recycling or disposal, and associated costs
- Mercury concentration in wastewater and in incinerator ash, because mercury is not being improperly disposed

Document the reductions and prepare periodic progress reports about your mercury pollution prevention achievements.

Advertise Success

List entities inside and outside of the hospital who should share in the good news of your success. Develop a communication plan that includes both formal reports and informal updates on progress.

Communicate with:

- The hospital board of directors through an annual report that describes accomplishments, upcoming actions and expected outcomes.
- Other hospitals through hospital association meetings and mailings.
- Employees through individual letters, departmental letters that can be read at meetings, a hospital newsletter or posters. Go beyond a progress report and include congratulations and awards for employees who have made useful suggestions for reducing mercury.
- Local officials, such as wastewater treatment plant officials and the health department, through formal letters.
- The general public through press releases, stories in local newspapers, participation in health and environmental fairs, and pamphlets or posters available for doctors' offices.

Best Management Practices for Mercury-Containing Products in the Hospital

Introduction

"Best management practices" for mercury are the procedures that have been found by experience to effectively prevent the release of mercury into the environment. By implementing best management practices now, the hospital can help to avoid the need for increased regulations in the future. For most mercury-containing products in the hospital, the preferred best management practice is to replace the item with a mercury-free product. However, it may not be possible to replace all of the hospital's mercury products at once and, in a few cases, there may not be a substitute that is considered to be reliable and cost-effective. For these products, best management practices are effective procedures for handling and either recycling or disposing of the mercury-containing products. Recycling is recommended. Disposal should be the last resort.

> ***"For most mercury-containing products in the hospital, the preferred best management practice is to replace the item with a mercury-free product."***

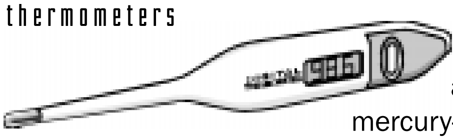
Mercury-containing products can be found almost anywhere in the hospital. They range from medical instruments and clinical laboratory chemicals to electrical equipment and cleaning solutions. This chapter is organized by product (thermometers, laboratory chemicals, etc.). For each product the chapter describes:

- The alternatives for mercury-containing products
- The best management practices for handling and recycling or disposing of mercury-containing products that are still in use

In all cases, when a mercury-containing product is still in use, the hospital's hazardous waste management coordinator will have the ultimate responsibility for its recycling or disposal. All personnel within the hospital who handle mercury-containing products must cooperate with the hazardous waste management coordinator to develop appropriate procedures for the handling of items to be discarded and their transportation to the designated hazardous waste collection point.

Fever Thermometers

Alternatives for mercury-containing thermometers



See the table of alternatives for mercury-containing thermometers following the "Fever Thermometers" section.

Take-home thermometers

If some units of the hospital send thermometers home with their patients, hand out mercury-free thermometers. The take-home thermometer might be digital, chemical strips or a glass thermometer filled with a non-mercury liquid metal alloy. The use of a mercury-free alternative will prevent the release of mercury into the environment when the family breaks or otherwise discards the thermometer.

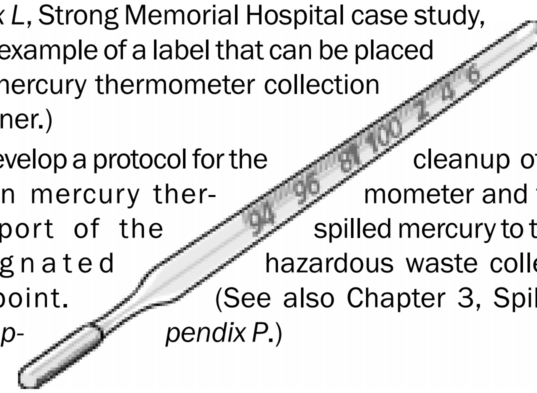
If an alternative has not yet been evaluated and chosen, and mercury thermometers must be distributed in the meantime, educate patients about how to recycle the mercury after a thermometer has been broken or if one is to be discarded. This can be done most easily by handing out written information with the thermometer. This information should also be available at the hospital's information desk. (See *Appendix K* to learn how mercury from thermometers should be recycled in several counties. Use it as a handout to give to your patients.)

Keep mercury thermometers out of red bags and sharps containers

Mercury volatilizes easily. When a mercury thermometer has been placed in a red bag or sharps container that is incinerated or autoclaved, the mercury becomes a gas and enters the air. Mercury that has vaporized in an autoclave may also condense along with the steam and enter wastewater. Mercury thermometers should not be placed in red bags or sharps containers, even in an isolation unit. The hospital's protocol for isolation units should make it clear that thermometers can be removed from the unit as long as they are disinfected first. (See *Appendix L*, Strong Memorial Hospital case study, for an example of a "no mercury thermometers" label that can be placed on a red bag container or sharps container.)

Recycling/disposal of mercury-containing thermometers

Develop a procedure for discarding mercury thermometers. The thermometers could be placed at a collection station that is convenient for nursing personnel and that is designated specifically for the temporary storage of hazardous materials. Make a container available at the collection station for the thermometers and label it clearly. The container could be emptied or picked up on a regular basis or on an as-needed basis, according to the instructions of the hazardous waste management coordinator. (See *Appendix L*, Strong Memorial Hospital case study, for an example of a label that can be placed on a mercury thermometer collection container.)



Develop a protocol for the cleanup of a broken mercury thermometer and for transport of the spilled mercury to the designated hazardous waste collection point. (See also Chapter 3, Spills, and *Appendix P*.)

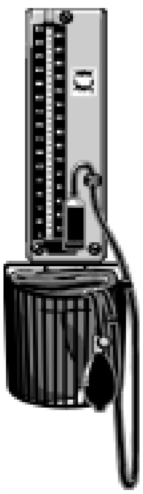
Table 1. Alternatives for Mercury-Containing Thermometers

Type of thermometer	Cost	Accuracy	Time for Reading	Calibration Frequency	Comments
Electronic (digital): oral/rectal	Thermometer: approx. $300. Disposable probe covers: pennies apiece. Take-home can be < $5	Comparable to mercury	Oral: seconds Rectal: seconds	Every 6 mo. - 1 year (Some need initial testing only)	Requires batteries
Electronic (digital): tympanic (also called infrared thermometer)	Thermometer: approx $300. Disposable probe covers: pennies apiece.	Comparable to mercury	Seconds	Every 6 mo.-1 year. (Some need initial testing only)	Requires batteries. Must use “pull and tug” method to get correct placement. Can select to give equivalent oral/rectal reading.
Chemical strip, single-use dispos-able (plastic or paper strips with dots filled with different chemical mixtures, each formulated to melt and change color at a given temperature)	Pennies apiece	Comparable to mercury	Oral: 1 minute Axilla: 3 minutes	None required	Does not record temperatures below 35° C (95° F)
Glass filled with with alloy of gallium, indium and tin; a liquid at room temperature	Approximately $3.00	Comparable to mercury	3 minutes	None required	Breakable
Mercury	Approximately $0.40	Considered to be the “gold” standard” for accuracy comparisons	Oral: 5 minutes Axilla: 7 minutes	None required	Breakable. Average life expectancy 80 days in hospital setting, if reused. Disposal is expensive.

Sphygmomanometers

Table 2. Alternatives for Mercury-Containing Sphygmomanometers

Type of Sphygmomanometer	Cost	Comments
Aneroid	Wall model adult: $50-$80; portable model adult: $30-35	Needs calibration annually. Accuracy comparable to mercury.
Electronic	On the order of $2,000	Common where long-term continuous monitoring is needed, such as intensive care.
Mercury	Wall model adult: $60-70; portable model adult $60-70	Requires annual refilling and calibration. Easily breakable. Disposal is expensive. Not recommended for carpeted areas.



Refilling mercury-containing sphygmomanometers

In order to ensure optimal performance, manufacturers of sphygmomanometers recommend that the mercury be removed and filtered at regular intervals. Once a year is a typical interval, but the mercury should also be removed and filtered any time there is a question about the performance of a sphygmomanometer. If a broken device is to be repaired, it too must have the mercury removed and filtered.

If it is not yet feasible for your hospital to replace all of its mercury sphygmomanometers, make sure there is a protocol for their handling and refilling that is consistent with manufacturer's instructions and Occupational Safety and Health Administration (OSHA) standards. The protocol might include the following instructions:

1. Place the sphygmomanometer to be refilled in a clear plastic bag and seal the bag. Do not use a red bag or biohazard bag.
2. Mark the bag: "CONTAINS MERCURY."
3. Place the bag in a plastic basin to contain spills while transporting to the area where the sphygmomanometer is to be refilled.
4. Wear appropriate protective clothing and work within a hood to provide ventilation.
5. Handle over a tray to contain any spills. Never handle mercury over a sink or floor drain.
6. Carry the sphygmomanometer back to the patient room as described in steps 1-3 after refilling.

(See the Chapter 3 section on Spills for other precautions.)

Recycling/disposal of mercury-containing sphygmomanometers

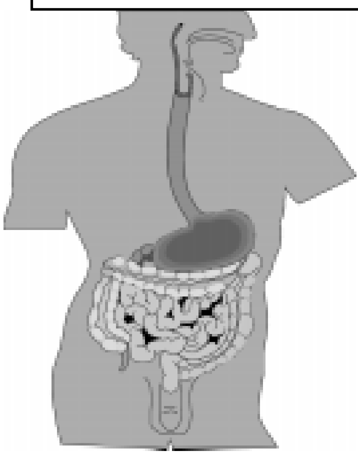
Develop a protocol for the preparation of mercury sphygmomanometers for recycling or disposal that is consistent with U.S. Environmental Protection Agency, New York State Department of Environmental Conservation (NYSDEC) and local regulations, and other pertinent standards. (*See Appendix C* for NYSDEC and local contacts.) Contact your hazardous waste management coordinator for details about packaging, labeling and transporting that are specific to your facility. A suggested protocol might include the following instructions:

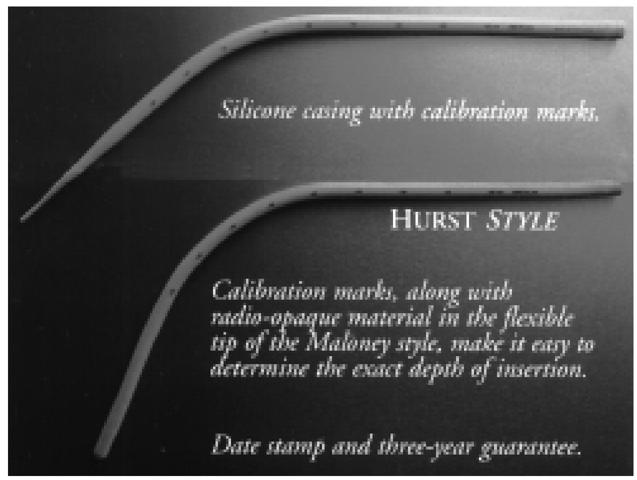
1. Place the sphygmomanometer in a clear plastic bag and seal the bag. Do not use a red bag or biohazard bag.
2. Mark the bag: "CONTAINS MERCURY."
3. Place the bag in a plastic basin to contain any spills during transport to the designated hazardous waste collection point.

Gastrointestinal Tubes

Table 3. Alternatives for Mercury-Containing Gastrointestinal Tubes

Type of GI Tube	Mercury-Free Alternative and Effectiveness
Bougie tubes (esophageal dilators)	Tungsten. Considered to be as effective as mercury.
Cantor tubes (used to trace the GI tract)	Tungsten. Can be purchased empty of weighting and hospital adds the weighting material, either mercury or tungsten. Some feel tungsten weighting is not as effective as mercury because it is not as heavy.
Miller Abbott tubes (used to clear intestinal obstructions)	Tungsten. Can be purchased empty of weighting and hospital adds the weighting material. Tungsten replacement is considered to be as effective as mercury.
Feeding tubes	Tungsten. Considered to be as effective as mercury.

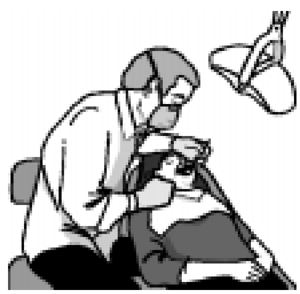




Recycling/disposal of mercury-containing gastrointestinal tubes

Gastrointestinal tubes typically have expiration dates, after which their use must be discontinued. Make sure the hospital has a protocol for the handling and recycling or disposal of mercury-containing tubes that is consistent with U.S. Environmental Protection Agency, New York State Department of Environmental Conservation (NYSDEC) and local regulations, and other pertinent standards. (*See Appendix C* for NYSDEC and local contacts.) Contact your hazardous waste management coordinator for details about packaging, labeling and transporting that are specific to your facility. A suggested protocol might include the following instructions:

1. Place the tube(s) in a clear plastic bag and seal the bag. Do not use red bags or biohazard bags.
2. Mark the bag: "CONTAINS MERCURY."
3. Place the bag in a plastic basin to contain any spills during transport of the tubes to the designated hazardous waste collection point.



Dental Amalgam and Mercury

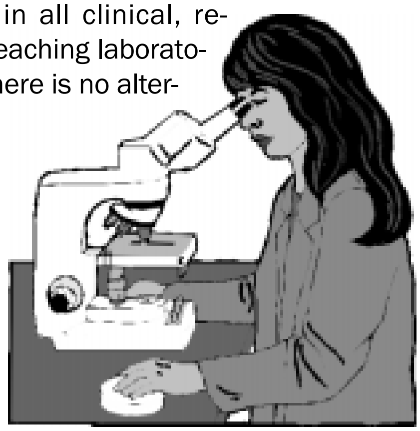
Many hospitals do not have dental facilities. However, some hospitals do have a clinic within the hospital or as part of another facility with which they are affiliated, such as a nursing home. For the benefit of hospitals that have dental clinics, a booklet, "Prevent Mercury Pollution: Use Best Management Practices for Amalgam Handling and Recycling" can be found in *Appendix M*. The mercury pollution prevention best management practices described in the booklet were developed simultaneously with those described in this manual.

Laboratory Chemicals

Whenever laboratories use mercury-containing chemicals, there is the potential for the release of mercury into wastewater. Once mercury in wastewater enters a wastewater treatment plant, most of it concentrates in the sludge. The sludge may either be spread on land or incinerated. Either way, the mercury in the sludge will eventually be released into the environment.

Phase out all nonessential uses of mercury in laboratories:

- Eliminate the use of mercury-containing compounds in all clinical, research and teaching laboratories unless there is no alternative.



- Eliminate all nonessential mercury devices, such as thermometers and barometers, and replace them with mercury-free devices.
- Clear laboratories and storage areas of unnecessary mercury compounds.

See *Appendix B* for categories of laboratory chemicals that may include mercury.

Alternatives for mercury-containing laboratory chemicals

The mercury compound in a chemical formulation may be an active ingredient, a preservative, or a contaminant introduced during the manufacture of one of the ingredients. The alternative depends on the reason that mercury is present. If a mercury compound is an active ingredient, the replacement may be a compound of a less hazardous metal. If a mercury compound is a preservative, the formulation can often be replaced by a formulation that uses a non-mercury preservative. If mercury is a contaminant, a formulation can often be found with ingredients manufactured by a different method. Examples of alternatives to mercury-containing chemicals common in a clinical laboratory are shown in the table.

Because mercury may be present in very small amounts as a preservative or contaminant, it may not be obvious whether or not a chemical reagent or stain contains mercury. Manufacturers might not list the ingredients of a reagent or stain if the formula is under copyright protection. Material Safety Data Sheets

Table 4. Alternatives for Mercury-Containing Laboratory Chemicals

Compound	Possible Alternatives
Histological fixatives (such as B5 and Zenker's Solution) with mercury (II) chloride as a tissue preservative	Zinc formalin; other products are available that are both mercury-free and formaldehyde-free.
Mercury (II) chloride as an oxidizer in hematoxylin	Sodium iodate as oxidizer.
Chemical used for acidic drug analysis of barbiturates and benzodiazepines by thin layer chromatography (such as Toxi-Dip B3)	Gas chromatography/mass spectrometry method. A hospital may need to send samples to a lab that has the equipment and specially trained staff required.
Thimerosal (Trademark Merthiolate) as a preservative in stains and other products in the pH neutral range	Methyl paraben, propyl paraben

might not list mercury in a product if the formula is under copyright protection or if the amount is less than one percent. However, the contribution of many low-concentration sources accounts for a large fraction of the mercury in the wastewater stream.

The hospital purchasing agent should contact the hospital's suppliers and request that mercury-free reagents be supplied. If the usual supplier cannot provide mercury-free reagents, locate one that can. Request that all vendors disclose mercury concentration on a Certificate of Analysis. Products with no or low mercury can then be selected for purchase. The Certificate of Analysis should list mercury content in parts per billion (ppb), not as a percentage. (See a sample letter requesting a Certificate of Analysis and a sample Certificate of Analysis in *Appendix H*.)

Wherever possible, change methodologies to processes that do not involve mercury. For chemicals that normally include a preservative, select chemicals that use a mercury-free preservative. Watch for new products. Many reagents and stains that once contained mercury have been reformulated so that they are now mercury-free.

The cost of mercury substitutes can be comparable and, in some cases, may be less than the cost of mercury-containing chemicals. Some substitutes may also carry some environmental risk, but it will probably be less than the risk associated with mercury.

Recycling/disposal of mercury-containing laboratory chemicals

When the laboratory staff has training on the proper use, handling and disposal of hazardous materials, incorporate the importance of keeping mercury out of wastewater. Make the staff aware of laboratory products that are known to contain mercury. It is important that laboratory chemicals ready for recycling or disposal be kept separately from each other and not mixed. This will minimize any increase in the amount of hazardous waste generated.

If using a mercury product is essential, the mercury-contaminated waste should be collected and disposed as hazardous waste. Check with your local sewer district for information about the proper disposal of mercury-contaminated rinse water.

Even if mercury-containing chemicals are not still in use, they may still be present in storage areas and they must be disposed as hazardous waste. Contact the hospital's hazardous waste management coordinator about transporting the chemicals to the designated hazardous waste collection point. Protective clothing or debris that is contaminated with a mercury compound should be managed in accordance with U.S. Environmental Protection Agency and New York State Department of Environmental Conservation (NYSDEC) regulations. (See *Appendix C* for NYSDEC contacts.)

Pharmaceutical Products

Currently mercury can be present in pharmaceutical products even when it is not listed on the label or on the product information sheet. As can be seen in the table below, the mercury is usually introduced as a preservative.

Alternatives for mercury-containing pharmaceutical products

Be aware of changes in the pharmaceutical industry. In many cases, products with mercury-free preservatives are available, and additional alternatives are likely to be available in the near future. In the meantime, request mercury-free pharmaceutical supplies whenever possible. Ask your vendor to assist the hospital in selecting mercury-free products for the pharmacy. (See sample vendor product mercury-content disclosure in *Appendix I*.)

Table 5. Pharmaceutical Uses of Mercury

Product	Notes
Merbromin/water solution	Used in plastic/reconstructive surgery as a disinfectant and marker
Ophthalmic and contact lens products	May contain mercury preservatives: thimerosal, phenylmercuric acetate, phenylmercuric nitrate
Nasal Sprays	May contain mercury preservatives: thimerosal, phenylmercuric acetate, phenylmercuric nitrate
Vaccines	May contain thimerosal (primarily in hemophilus, hepatitis, rabies, tetanus, influenza, diphtheria and pertussis vaccines)

Cleaners and Degreasers

Mercury as a contaminant

The mercury-cell process is one of the processes that may be used to manufacture common ingredients of cleaners and degreasers: sodium hydroxide (caustic soda), potassium hydroxide, chlorine and hydrochloric acid (muriatic acid). When these chemicals are used to make other products, such as bleach or soaps, mercury contamination can be introduced into the final product. The Massachusetts Water Resources Authority (MWRA) and Medical, Academic and Scientific Community Organization, Inc. (MASCO), through a public-private partnership called the MWRA/MASCO Mercury Work Group, performed laboratory analyses on some of these products. (See *Appendix J*, Educational Resources for a Mercury Pollution Prevention Program and the MWRA/MASCO case study in *Appendix L*.)

Table 6. Mercury Content of Selected Cleaning Products*

Information from MWRA/MASCO Mercury Work Group	
Product	Mercury Content (ppb)
Ajax Powder	0.17
Comet Cleaner	0.15
Lysol Direct	<0.011
Soft Scrub	<0.013
Alconox Soap	0.004 mg/kg, 0.005 mg/kg, <0.0025 mg/kg (3 tests)
Derma Scrub	<5.0, <2.5 (2 tests)
Dove Soap	0.0027
Ivory Dishwashing Liquid	0.061
Joy Dishwashing Liquid	<0.01
Murphy's Oil Soap	<0.012
Soft Cide Soap (Baxter)	8.1
Sparkleen Detergent	0.0086
Sunlight Dishwashing Detergent	<0.011

*Testing on cleaning products has been limited and many common cleaning products have not been tested. The data should not be used as a substitute for testing specific products/chemicals.

Alternatives for mercury-containing cleaners and degreasers

To learn the mercury content of the cleaners and degreasers used by the hospital, request Certificates of Analysis from all suppliers when purchasing materials. Choose mercury-free products, if possible. If there are no mercury-free products that meet the needs of the hospital, choose those that are the lowest in mercury concentration.

The Certificate of Analysis should list mercury content in parts per billion (ppb), not as a percentage. A Material Safety Data Sheet is *not* equivalent to a Certificate of Analysis. (See *Appendix H* for a sample letter requesting a Certificate of Analysis and a sample Certificate of Analysis.)

Batteries

Mercury-containing batteries

Mercuric oxide (mercury zinc) batteries and button batteries are the only batteries made in the United States that may contain added mercury if newly purchased (see table). Mercuric oxide batteries offer a reliable and constant rate of discharge and can be made in a wide variety of sizes intended for use in medical devices. In the 1990s, manufacturers stopped designing equipment that requires mercuric oxide batteries. New models generally require zinc air batteries. However, mercuric oxide batteries may remain in hospital stock for many years for use in older equipment. The shelf life of mercuric oxide batteries is up to ten years.

Some of the medical devices that may still require mercuric oxide batteries include cardiac monitors, pH meters, oxygen analyzers and monitors, and telemetry instruments. See *Appendix A* to see the variety of devices in which mercury-containing batteries have been used.

Alternatives for mercury-containing batteries

Table 7. Batteries (Newly Purchased) That May Contain Added Mercury (1998)

Battery	Quantity of Mercury	Use	Voltage	Available Alternatives
Mercuric oxide (mercury zinc)	33-50% by weight	Medical	Multiples of 1.4 v	Zinc-air (may contain up to 25 mg mercury, 0.4-1.0% by weight)
Button batteries: Zinc air	No federal law, but addition of mercury over 25 mg prohibited by some states. Manufacturers use this standard for all button batteries.	Medical	Multiples of 1.4 v	None
Button batteries: Alkaline-manganese	Federal law allows up to 25 mg mercury	Consumer	Multiples of 1.5 v	Silver oxide (lasts longer, costs more, does not come in a full range of sizes)
Button batteries: Silver oxide	Contains some mercury but less than alkaline-manganese button batteries	Consumer	Multiples of 1.5 v	None

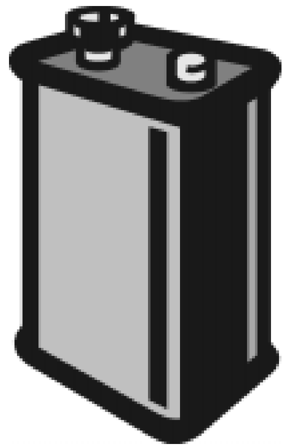
The alternative for mercuric oxide batteries is zinc air batteries. However, the alternative may not be mercury-*free*. A zinc air button battery may contain up to 25 mg of mercury. Larger zinc air batteries are made up of stacked button batteries, each of which may contain up to 25 mg of mercury. It is not yet possible to eliminate mercury from these batteries. In the absence of mercury, the zinc electrode corrodes and creates hydrogen gas. Because the batteries are tightly sealed, they can bulge when the gas is created and may even explode. Note that zinc air batteries include a tab that prevents exposure of the internal part of the battery to air (air serves as one of the electrodes). Once the tab on a zinc air battery is pulled off, the internal part of the battery is exposed to air and it begins to discharge.

For medical devices, there are Food and Drug Administration and Underwriters Laboratory certification concerns with replacing a battery. It is important to contact the equipment manufacturer before replacing a mercuric oxide battery with a substitute to ensure that the device has been approved for use with the alternative battery.

Rechargeable (nickel-cadmium) batteries cannot be used as an alternative to mercuric oxide batteries.

Recycling/disposal of batteries

Provide many convenient collection points for batteries throughout the hospital, including areas where replacement batteries are obtained. There are two options for collection:



1. Collect only mercury-containing batteries. This would put the responsibility for knowing mercury content on the person who is discarding the battery. The hazardous waste management coordinator could post written guidance at the collection location. However, this option could be confusing for the user.
2. Collect all batteries. The hazardous waste management coordinator or recycler would take responsibility for sorting the batteries. The coordinator should determine which types of used batteries are hazardous waste, which types can be recycled and which types can be thrown away as trash. Spent mercury-containing batteries should be recycled.

Some battery manufacturers offer recycling programs for mercuric oxide batteries. Check with the hospital's battery suppliers to learn if they have collection plans and if they will coordinate packaging and transportation to their facilities. Check with the New York State Department of Environmental Conservation (NYSDEC) to ensure that the specific program is legal. (See *Appendix C* for the NYSDEC hazardous waste regulations telephone number.)

Lamps

Energy efficiency of mercury-containing lamps

Fluorescent lamps, high-intensity discharge (HID) lamps and ultraviolet lamps (used in biosafety cabinets) are among the few mercury-containing products within hospitals for which adequate non-mercury substitutes do not exist.

Fluorescent and HID lamps are efficient sources of white light, typically 3-4 times more efficient than incandescent lamps. Since fossil fuels contain mercury, power generation releases mercury and other pollutants to the environment, and these releases are greater when less efficient lamps are used. Considering both mercury emissions from power generation and mercury contained in the lamps themselves, incandescent lamps put more mercury into the environment than do fluorescent lamps.

Investigate the mercury content of fluorescent and HID lamps and purchase those with a relatively low mercury content. In recent years, lamp manufacturers have been reducing the amount of mercury in fluorescent lamps. Some lamps are low enough in mercury content to be considered nonhazardous for waste recycling and disposal purposes. Check verifiable product information on Toxicity Characteristic Leaching Procedure (TCLP) testing to learn if this is the case.

Recycling/disposal of mercury-containing lamps

There should be several convenient collection points for spent lamps within the hospital. Lamps from the collection points should be taken by the hazardous waste management coordinator to the hospital's designated hazardous waste collection point. The lamps can be sorted for recycling or disposal at the collection point. *Do not break or crush lamps*, unless using a commercial lamp crusher that captures mercury vapor. Because crushing lamps may be considered to be "treatment," consult with your regional office of the New York State Department of Environmental Conservation (NYSDEC) before purchasing a lamp crusher. (See *Appendix C* for telephone number.)

If a lamp is accidentally broken in the hospital, store all of the debris in a sealed plastic container. Request pick-up by the hazardous waste management coordinator.

The exact procedures for sorting, storage, packing, and recycling or disposal will partly depend on the requirements of the NYSDEC. (See *Appendix C* for the NYSDEC hazardous waste regulations telephone number.) It is important to know your generator status before asking questions. Some of the questions to ask the NYSDEC are:

1. Which lamps can and cannot be recycled?
2. Which lamps must be considered as hazardous waste?
3. How should lamps for recycling be packed for transporting? Should they be whole or crushed in a bulb crusher? What is the cost of a bulb crusher?
4. How should broken lamps be packaged?

Since fluorescent and HID lamps fail TCLP testing for mercury a high percentage of the time, it is suggested that expensive TCLP testing be minimized and that those disposing of these lamps assume them to be hazardous unless verifiable product information states that the lamps are nonhazardous.

Watch for changes in the regulations that affect mercury-containing lamps. Get the latest information from the NYSDEC. (See *Appendix C*. Also see *Appendix N* for a partial list of fluorescent lamp recyclers.)

U.S. Environmental Protection Agency (EPA) Green Lights Program

The EPA's Green Lights Program can help the hospital save money on lighting costs and, at the same time, reduce the amount of mercury that is emitted to the air when fossil fuels are burned at the local power plant that supplies electricity.

Organizations, such as hospitals, that join Green Lights sign a Memorandum of Understanding with EPA to become a "Partner." Partners agree to consider available technologies and install the mix of lighting products and controls that maximize energy savings and maintain or improve lighting quality.

EPA offers information, analysis, and planning and communications services to the Partner. For further information, contact the Green Lights Program by phone at 202-775-6650 or by fax at 202-775-6680.

Electrical Equipment

Alternatives for mercury-containing electrical equipment

Mercury can be found in many types of electrical equipment (see table below) and the equipment can have a lifetime measured in decades. Renovation is usually the reason that the equipment is replaced. Even if mercury use in newly manufactured equipment is discontinued, the recycling or disposal of used equipment will require an awareness of the mercury content for a long time to come.

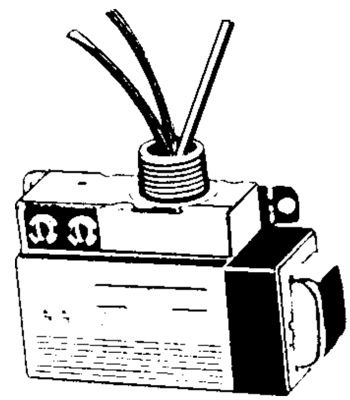


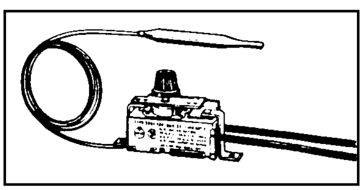
Table 8. Mercury-Containing Electrical Equipment

Type of Switch	Where Equipment is Used	Possible Alternative
Tilt switch	–Airflow/fan limit control –Building security systems –Clothes iron –Fire alarm box –Fluid level, pressure or temperature control devices –Laptop computer screen shutoff –Lids of clothes washers and chest freezers –Silent light switch –Space heater –Thermostats	-Mechanical switch
Float switch	–Bilge pumps –Septic tank –Sump pump	–Magnetic dry reed switch –Optic sensor –Mechanical switch
Thermostat	–Temperature control device may have a mercury tilt switch.	–Electronic thermostat
Reed relay	–Low voltage, high precision analytical equipment such as electron microscope	–Solid state relay –Electro-optical relay –Dry reed relay
Plunger or displacement relay	–High current, high voltage applications such as lighting, resistance heating, power supply switching	–Mechanical switch
Thermostat probe	–Electric stoves –Hot water heaters	–Non-mercury probe

Manufacturers have not eliminated mercury in all electrical equipment due to cost considerations. However, because of an awareness of mercury problems, manufacturers are increasingly making alternatives available. Ask your vendor to assist the hospital in selecting mercury-free products. (See sample vendor product mercury-content disclosure in *Appendix I*.)

Recycling/disposal of mercury-containing electrical equipment

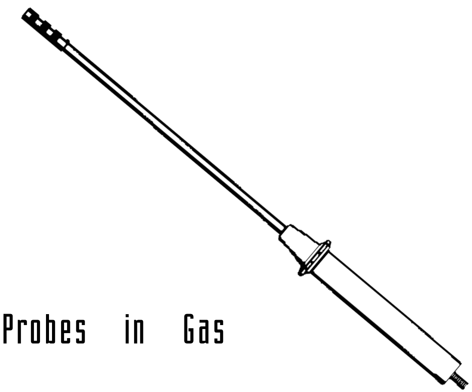
If the hospital is preparing used electrical equipment for recycling or disposal and there is a question about the mercury content, obtain this information from the manufacturers. Remove any mercury-containing parts from the equipment. Store the parts in a tightly covered container labeled as to its contents. Parts from switches, thermostats, relays and thermostat probes (including the thermostat probes described in the section on Thermostat Probes in Gas Appliances) can be stored in the same container. The container could be located in the supply area of the hospital where replacement parts are stored until it is full and ready for transport to the hospital's designated hazardous waste collection point. Recyclers are available that accept these equipment components. (See *Appendix N*.)



Take-back programs for thermostats

Honeywell Corporation has a free take-back program to collect any brand of used mercury-containing thermostats. To use the system, contact a heating, ventilating and air-conditioning wholesaler to learn if the wholesaler is participating in the program. Honeywell provides a special container for thermostats to each participating wholesaler. Do not remove the switches from your thermostats before taking them to the wholesaler. (Call 800-345-6770 for further information.)

Honeywell is one example of a take-back program. Other companies may have such programs. Contact your supplier to learn if this option is available. Take-back programs may be subject to Universal Waste Rules that have been adopted by New York State. Check with the New York State Department of Environmental Conservation (NYSDEC) to ensure that the specific take-back program is legal. (See *Appendix C* for NYSDEC hazardous waste regulations telephone number.)



Thermostat Probes in Gas Appliances

Mercury-containing thermostat probes may be found in several types of gas-fired appliances that have pilot lights, such as ranges, ovens, clothes dryers, water heaters, furnaces or space heaters. They are usually present as part of the safety valve that prevents gas flow if the pilot light is not lit. The metal probe consists of a metal bulb and thin tube attached to a gas-control valve. The bulb of the probe projects into or near the pilot light. The mercury is inside the tube and expands or contracts to open and shut the valve.

A mercury thermostat probe may also be part of the main temperature-controlling gas valve. In this application, the probe is in the air or water that is being heated and is not directly in contact with any flame. These are typically found in older ovens, clothes dryers, water heaters and space heaters.

If there is a question about the mercury content of a thermostat probe, obtain this information from the manufacturer.

Alternatives for mercury-containing thermostat probes in gas appliances

Non-mercury thermostat probes are also used in the appliances listed above. They are:

- Sodium/potassium thermostat probes
- "Dissimilar metals" thermostat probes

Recycling/disposal of mercury-containing thermostat probes in gas appliances

Remove thermostat probes from the appliances to be discarded and store them along with the mercury-containing electrical equipment described in the section on Electrical Equipment. Place them in a covered container that is labeled as to the type of equipment being stored. The container could be located in the supply room of the hospital where the replacements are stored until it is full and ready for transport to the hospital's designated hazardous waste collection point.

Industrial Thermometers

Air and water heating and cooling systems employ thermometers to allow monitoring of the systems' performance. Many of these thermometers are mercury in glass.

Recycling/disposal of mercury-containing industrial thermometers

It will be necessary to properly recycle or dispose of mercury industrial thermometers if the hospital is retrofitting with mercury-free thermometers or if it is replacing an entire heating or cooling system that employed mercury thermometers. The thermometers should be packed for delivery to the designated hazardous waste collection point in a tightly closed container and in a manner that will prevent breakage of the thermometers. Contact the hazardous waste management coordinator for detailed instructions.

Table 9. Alternatives for Mercury-Containing Industrial Thermometers

Type of Thermometer	Approximate Cost	Accuracy	Comments
Digital	$39	Within 1% of scale range	Light-powered, no battery required; interchangeable with mercury thermometer as to threading and well
Bimetal	$45-47	Within 1% of scale range	Contains a glass "window" but glass does not contain a liquid; *not* interchangeable with mercury thermometer as to threading and well
Alcohol-filled	$40	Within 1% of scale range	Red-colored alcohol in glass tube; interchangeable with mercury thermometer as to threading and well
Mercury	$32	Within 1% of scale range	Mercury in glass tube

Pressure Gauges

Devices that measure pressure may contain mercury. These include:

- Laboratory manometers used by biomedical engineers to calibrate other instruments in the hospital
- Barometers
- Sphygmomanometers (see the section on Sphygmomanometers)

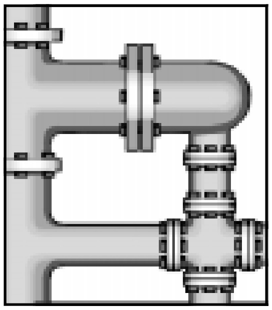
The most common alternative to a mercury-containing barometer is an aneroid barometer.

Table 10. Alternatives for Mercury-Containing Laboratory Manometers

Type of Manometer	Cost	Comments
Electronic (digital)	Several hundred dollars	An order of magnitude more accurate than sphygmomanometers. Used in biomedical laboratory to calibrate other devices. A traceable calibration must be performed with a mercury manometer, onsite or offsite, on a regular schedule. The time interval depends on the manufacturer's recommendation.
Aneroid (Bourdon, diaphragm, piston or capsule types)	Price varies widely depending on accuracy & traceability required	Manufacturers recommend calibration at least annually. Schedule can be based on experience, with annual inspections as a minimum.
Liquid filled	Price varies widely depending on accuracy & traceability required	Inadvisable to move them from place to place. Manufacturers recommend calibration at least annually. Schedule can be based on experience, with annual inspections as a minimum.
Mercury	$100-$150 range	One meter tall. An order of magnitude more accurate than sphygmomanometers. Used in biomedical laboratory to calibrate other devices. Annual calibration recommended to ensure good performance.

Recycling/disposal of mercury from mercury-containing gauges

Store mercury waste from servicing manometers and other mercury-containing gauges in a covered, air-tight plastic container. The container must be clearly labeled: CONTAINS MERCURY. Small amounts can be stored in vials placed in a larger covered air-tight container, such as a five-gallon plastic pail. Recycle the mercury. (See *Appendix N* for a list of recyclers.)



Plumbing

Mercury may be present in a hospital's sewer pipes, sumps and sink traps from the past use of mercury. The mercury may have entered the pipes when items were broken, discarded or spilled in sinks. Mercury in plumbing can settle at a low point such as a sump or sink trap and remain in the plumbing of a hospital for many years. Often the slow dissolution of the mercury in a pipe, sump or sink trap is enough to cause violations of wastewater discharge standards even after best management practices for mercury have been introduced in the hospital.

Whenever sewer pipes, sumps or sink traps are to be moved or cleaned, the plumber must be warned about the potential of finding mercury in the sludge. The sludge must be handled and disposed as hazardous waste unless it is demonstrated, through the Toxicity Characteristic Leaching Procedure (TCLP) or verifiable user knowledge, that it is not hazardous. Procedures for cleaning traps and pipes that were developed by the Massachusetts Water Resources Authority/Medical, Academic and Scientific Community Organization Mercury Work Group can be found in *Appendix O*.

Hospitals have reported success in lowering their wastewater levels after cleaning out their plumbing. After conducting such a cleaning program, a hospital must follow the recommendations in this chapter in order to avoid reintroducing mercury into the plumbing system.

Spills

Accidental spills of liquid mercury can increase the levels of mercury in the air or wastewater of a health care facility. Small droplets of spilled mercury may lodge in cracks, mix with dust and go down drains. Mercury may adhere to fabrics, shoe soles, watches and jewelry on which it can be transported to other locations. A small spill of mercury in a carpeted patient room can become a major clean-up challenge.

Mercury spill prevention

Follow proper procedures when cleaning or refilling instruments that contain mercury:

- Clean or refill instruments over a tray to contain any spills. Never handle mercury over a sink. Reserve the room for mercury use only. Restrict traffic in the area.
- Clean and calibrate all mercury-containing equipment according to the manufacturer's recommended handling procedures and the procedures recommended by your hospital's safety officer.
- Train all workers who use mercury devices about the properties and hazards of mercury, safe handling procedures, and specific policies related to mercury recycling and disposal.

Minimizing the impact of a spill is part of spill prevention. It is preferable to use mercury devices in rooms that do not have carpeting or other floor coverings which are not smooth and easily cleaned. Mercury devices should not be used in units which use beds that have high structures or projections off the beds that can smash wall-mounted sphygmomanometers, or in areas where patients cannot be moved.

Mercury spill response

Mercury spills are very disruptive. A large spill will require removing the patient from the room during cleanup. The room would have to remain vacant until it is ensured that there is no longer mercury vapor in the air.

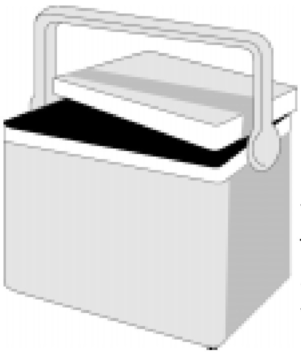
Be prepared for a spill in any area of the hospital where mercury-containing devices are used. Have a mercury vacuum cleaner or mercury spill kit readily available to consolidate spilled mercury and limit the amount of mercury released into the air. Never use a regular vacuum cleaner to clean up mercury. It will vaporize the mercury and blow it into the air. The mercury vacuum cleaner is designed to clean up liquid mercury spills. An activated carbon filter in this vacuum will absorb and contain the mercury vapors.

The cleanup of mercury spills must be performed by specially trained staff members. Carry out simulated spills and cleanup as part of training.

Create a formal mercury spill policy for the hospital. Consider the following factors when developing the policy:

- Round-the-clock availability of a competent staff person, trained for mercury spill cleanup
- Protective equipment and clothing for cleanup staff
- OSHA requirements
- The circumstances when the patient(s), visitors and staff should be evacuated from the area before cleanup
- How to determine when a room is "clean enough" to re-occupy
- Type of flooring (linoleum, carpet, etc.)
- Determination of the type of equipment to be used for the size and type of spill
- Manufacturer's instructions for the equipment to be used
- Ultimate waste disposal, which may depend on the cleanup method
- Preparation of an incident report that describes the spill, the cleanup method used, unusual circumstances, and follow up
- Mercury spills during a medical procedure

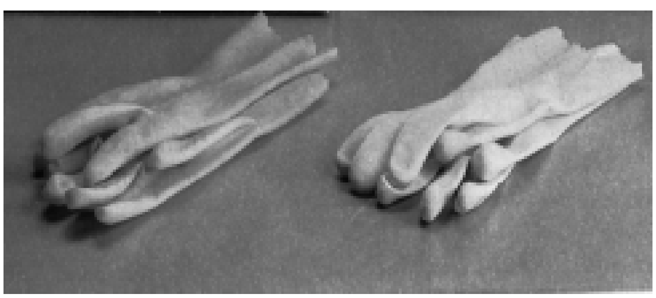
(See also the section on Hospital Employee Health and Safety and *Appendix P*.)



Storage Areas

Mercury-containing products not in use must be stored in nonbreakable containers with tight-fitting lids. The containers must be clearly labeled as to their contents. Rooms where mercury-containing items are stored should be tested periodically using a mercury vapor sniffer.

Even after most uses of mercury have been discontinued in the hospital, mercury-containing products may still be in storage from past uses. All hospital units should check storage areas for old, damaged or outdated equipment. (See *Appendix A* and *Appendix B* for lists of possible mercury-containing products in the hospital.) If mercury-containing products are found, contact the hazardous waste management coordinator. After the removal of the mercury-containing products, the areas should be checked with the mercury vapor sniffer.



Hospital Employee Health and Safety

A major concern with the use of mercury-containing products is the possible exposure of hospital employees to mercury vapor during a maintenance procedure, such as servicing mercury-containing equipment. Understand the properties and hazards of mercury. Check with your health and safety officer prior to doing such work to ensure that you are following correct procedures for:

- Ventilation
- Protective clothing and equipment
- Work habits, such as smoking, eating or drinking in the area and wearing jewelry (mercury readily combines with gold)
- Handling and recycling or disposal of mercury
- Follow-up monitoring

Conduct periodic training for all employees who may come into contact with mercury-containing products. Include new and temporary employees, employees at offsite locations, and contractors.

(See also the section on Spills.)

United States Environmental Protection Agency
Solid Waste and Emergency Response (5305W)
EPA530-K-02-014I
October 2001

RCRA, Superfund & EPCRA Call Center Training Module

Introduction to:

Miscellaneous and Other Units
(40 CFR Part 264, Subpart X and 40 CFR Part 265, Subparts P, Q, and R)

Updated October 2001

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MISCELLANEOUS AND OTHER UNITS

CONTENTS

1. INTRODUCTION

Congress recognized that it would be impossible for EPA and authorized states to issue permits to all hazardous waste management facilities before the Resource Conservation and Recovery Act (RCRA) Subtitle C program became effective in November 1980. RCRA §3005(e) provides for certain facilities to be treated as though they had been issued a permit until final administrative action is taken on their permit applications. This statutory permit is referred to as "interim status." EPA promulgated interim status management standards in 40 CFR Part 265.

Part 265 contains both general facility standards applicable to all facilities and requirements for specific hazardous waste management units and treatment processes. EPA initially promulgated interim status standards for the most common hazardous waste management units in existence at the inception of the RCRA program: containers, tanks, surface impoundments, waste piles, land treatment units, landfills, and incinerators (Part 265, Subparts I through O, respectively). EPA realized, however, that certain hazardous waste treatment and disposal practices were conducted in other types of units. As a result, the Agency also promulgated interim status standards for broadly defined treatment processes that are not performed in any of the previously listed units. These treatment processes include thermal treatment (Subpart P); chemical, physical and biological treatment (Subpart Q); and underground injection (Subpart R).

EPA promulgated final permit standards in Part 264 for all the specific hazardous waste management units originally set forth in Part 265, Subparts I through O, as well as both interim status and permit standards for boilers and industrial furnaces (BIFs), drip pads, and containment buildings. The Agency, however, never established final permit standards for thermal treatment units in Subpart P; chemical, physical, and biological treatment units in Subpart Q; or underground injection control (UIC) wells in Subpart R. As a consequence, facilities operating in interim status pursuant to these subparts could never receive final permits. In addition, new thermal, chemical, physical, and biological treatment facilities could not be constructed, since new hazardous waste facilities need a permit before construction commences.

The promulgation of the Part 264, Subpart X, miscellaneous unit regulations in 1987 bridged the gap between Part 265 and Part 264. Subpart X allows for the construction and permitting of units that do not meet the Part 264, Subparts I through W and DD, and Part 266, Subpart H, unit descriptions. It also allows interim status facilities with units that are not specified in these subparts to become fully permitted, to construct new units, or to expand existing units.

When you have completed this module, you will be able to describe the requirements for and components of the miscellaneous unit permitting process. Specifically, you will be able to:

- Describe the basic requirements and types of units under Part 264, Subpart X, and Part 265, Subparts P, Q, and R

- Explain when corrective action applies to these subparts

- Understand the relationship between Part 264, Subpart X, and Part 265, Subparts P, Q, and R.

Use this list of objectives to check your knowledge of this topic after you complete the training session.

2. REGULATORY SUMMARY

The RCRA regulations governing the management of hazardous waste at treatment, storage, and disposal facilities (TSDFs) are divided into general standards that apply to all facilities and unit- or process-specific standards. All thermal treatment units; chemical, physical, and biological treatment units; UIC wells; and miscellaneous units are subject to the general facility standards in Part 264/265, Subparts A through H (with the partial exception of UIC wells). Accordingly, an owner/operator must comply with personnel training; general waste analysis; preparedness and prevention procedures; contingency plans; special requirements for the handling of ignitable, reactive, or incompatible wastes; corrective action; closure; and any other applicable requirements.

In addition, each type of unit or process must comply with the relevant unit/treatment process-specific subpart in Part 264/265. This module outlines the unit/treatment process-specific design and operating requirements for the following types of hazardous waste management units:

- Part 265, Subpart P - Thermal Treatment
- Part 265, Subpart Q - Chemical, Physical, and Biological Treatment
- Part 265, Subpart R - Underground Injection
- Part 264, Subpart X - Miscellaneous Units.

2.1 THERMAL TREATMENT UNITS (SUBPART P)

Since incineration was the most prevalent method used to thermally treat hazardous waste in 1980, EPA established a subpart devoted specifically to this thermal waste management technique (Subpart O). The Agency realized, however, that hazardous waste may be thermally treated in units other than incinerators. So as not to discourage the development and use of alternative thermal treatment processes, EPA also promulgated interim status regulations for thermal treatment units that do not meet the definition of an incinerator, boiler, or industrial furnace. Thermal treatment is defined as the treatment of hazardous waste in a device that uses elevated temperatures as the primary means to change the chemical, physical, or biological character or composition of the hazardous waste (§260.10). Thermal treatment units include carbon regeneration units and devices employing processes such as molten-salt pyrolysis, calcination, wet-air oxidation, and microwave destruction. Since incinerators are a subset of thermal treatment units, many of the Part 265, Subpart P, requirements are similar to the Part 265, Subpart O, standards.

OPERATING REQUIREMENTS

Before adding hazardous waste to a thermal treatment unit, the unit must be operating under steady-state (normal) conditions of operation (§265.373). Owners/operators may use auxiliary fuel or other means to bring the unit to operational readiness before burning hazardous waste. The owner/operator must also perform waste analysis to determine the heating value of the waste, the halogen and sulfur content of the waste, and the concentrations of lead and mercury in the waste (§265.375). In addition, owners/operators are required to conduct monitoring and inspections of the temperature and emission control instruments, the stack plume, and all process and ancillary equipment (§265.377). At closure, all hazardous waste and hazardous waste residues must be removed from the thermal treatment unit. Finally, unless the thermal treatment unit receives a special certification, the unit may not treat dioxin-bearing hazardous wastes (F020, F021, F022, F023, F026, or F027) (§265.383).

OPEN BURNING AND OPEN DETONATION

Open burning and open detonation (OB/OD) of hazardous waste is prohibited in interim status thermal treatment units, except for OB/OD of waste explosives. Waste explosives include waste that has the potential to detonate and bulk military propellants that cannot safely be disposed through other modes of treatment. OB/OD must be performed in a manner that does not threaten human health or the environment, such as following minimum distance requirements for treatment near adjacent properties (§265.382).

2.2 CHEMICAL, PHYSICAL, AND BIOLOGICAL TREATMENT UNITS (SUBPART Q)

Facilities may conduct chemical, physical, and biological treatment of hazardous waste in units other than those specifically addressed in Part 265, Subparts I through O, W, and DD. Examples of treatment processes that are often not performed in RCRA-defined units include distillation, centrifugation, reverse osmosis, ion exchange, and filtration. To accommodate these unique units, the Agency promulgated interim status regulations for units that treat waste by chemical, physical, and biological treatment technologies in Part 265, Subpart Q. The Agency's primary concern was the safe containment of hazardous waste, hazardous waste constituents, and treatment by-products. As a result, Subpart Q standards resemble the container and tank standards in Part 265, Subparts I and J, respectively.

OPERATING REQUIREMENTS

The operating requirements for Subpart Q units specify that waste may not be placed in the equipment if the waste could cause the process or equipment to rupture, leak, corrode, or otherwise fail. In addition, where wastes are continuously fed into a process, the units must be equipped with a feed cut-off system (§265.401).

Subpart Q units must also comply with special requirements for ignitable or reactive wastes in addition to the general requirements for these wastes that apply to all RCRA facilities (§265.405). These standards require the owner/operator to remove the hazardous waste characteristic immediately before or after placement in the treatment process or equipment. Likewise, Subpart Q units must comply with special requirements for waste analysis in addition to the general waste analysis requirements (§265.402). Whenever a waste is to be treated by a process that is substantially different from any previous processes, the owner/operator must conduct waste analyses and trial treatment tests or obtain written documentation showing that the treatment will meet the applicable requirements.

Facilities must also inspect discharge control, safety equipment, and data gathered from monitoring equipment at least once each operating day. In addition, facilities are required to inspect the construction materials of the treatment process and confinement structures at least weekly for corrosion, erosion, or leakage (§265.403). At closure, all hazardous waste and hazardous waste residues must be removed from treatment processes or equipment, discharge control equipment, and discharge confinement structures (§265.404).

2.3 UNDERGROUND INJECTION (SUBPART R)

EPA originally intended to regulate UIC wells disposing of hazardous waste primarily under the Safe Drinking Water Act (SDWA). At the inception of the RCRA program, however, many states did not yet have a SDWA-approved UIC program. EPA promulgated the interim status regulations for existing UIC wells to address the period when UIC wells were used to dispose of hazardous waste but were not yet subject to the SDWA. EPA never intended to promulgate Part 264 final permit standards for UIC wells, since §270.60(b) allows a UIC permit to function as a RCRA permit-by-rule once corrective action has been performed for all solid waste management units (SWMUs) at the facility.

Class I and Class V wells used for injecting hazardous waste must have authorization under both SDWA and RCRA. A well has SDWA authorization once it obtains a permit issued under 40 CFR Part 144 or 145. A well is considered to have RCRA authorization when it meets one of the following conditions: qualifies for and maintains RCRA interim status; obtains a UIC permit and meets the requirements for a RCRA permit-by-rule; or obtains a RCRA Part B permit for all units, including the operating well.

The first option would allow the well to obtain RCRA interim status. The RCRA interim status regulations specify that UIC wells injecting hazardous waste are subject to all the Part 265 general facility standards, except closure (Subpart G) and financial assurance (Subpart H). The second option allows a well to qualify for a RCRA permit-by-rule. To obtain a RCRA permit-by-rule, the well must obtain a SDWA underground injection permit pursuant to Parts 144 and 145 and comply with §144.14 for wells managing hazardous waste (§270.60(b)). Finally, the UIC well may obtain a final RCRA permit. UIC wells may receive RCRA permits as miscellaneous units.

Because all Class I and Class V wells used for injecting hazardous waste require permits or permits-by-rule under RCRA Subtitle C, certain RCRA standards apply to these wells even if they have a permit-by-rule. Most significantly, they must comply with corrective action requirements. Likewise, any associated hazardous waste storage units at the UIC well facility must be permitted and would also be subject to corrective action.

2.4 MISCELLANEOUS UNITS (SUBPART X)

On December 10, 1987, EPA promulgated standards regulating miscellaneous units in Part 264, Subpart X (52 FR 46946). The promulgation of Subpart X extended RCRA permit eligibility to UIC wells and to interim status units performing thermal, chemical, biological, or physical treatment under Part 265, Subparts P, Q, and R. Additionally, new and innovative technologies managing hazardous waste in units not previously regulated under RCRA became eligible for RCRA permits as miscellaneous units.

In developing the Subpart X regulations, the Agency wanted to promulgate a new set of general standards that would cover the diverse technologies and units not yet covered in Part 264. To accomplish this goal, the Subpart X regulations are general, not technology-specific. In sum, miscellaneous units are required to be located, designed, constructed, operated, maintained, and closed in a manner that will prevent any unsafe releases into the groundwater, subsurface environment, surface water, wetlands, soil surface, or air. This media-based or pathway-based approach ensures that any potential problems arising from units are addressed.

The Agency regards the Subpart X regulations as environmentally more protective than the corresponding interim status regulations found in Part 265, Subparts P, Q, and R. Since the site-specific Part 264 permit provisions are tailored to specific facilities, these standards provide better environmental protection. Subpart X is also more flexible, as it allows new and innovative technologies to receive RCRA permits. In addition, these regulations give the implementing agency the flexibility to develop permit standards on a case-by-case basis when considering the technology-specific data required to be submitted by the applicant.

The following portion of the module describes and presents an overview of the types of units regulated by Part 264, Subpart X, and outlines the types of performance standards specified in the regulations. In addition, the section summarizes the monitoring, analysis, inspection, response, reporting, corrective action, and closure requirements for miscellaneous units.

TYPES OF UNITS COVERED BY SUBPART X

Miscellaneous units are defined as hazardous waste management units where hazardous waste is managed in a unit other than a container, tank, surface impoundment, pile, land treatment unit, landfill, incinerator, boiler, industrial furnace, UIC well, containment building, or unit eligible for a research, development, and demonstration (RD&D) permit (§260.10). Since Subpart X is intended to serve as a "catch all" category, the Agency did not develop an all-inclusive list of units designated as miscellaneous units. The Agency, however, felt it would be helpful to identify several types of units that may receive permits under Subpart X. The types of units subject to Subpart X include, but are not limited to:

- Placement of hazardous waste in geologic repositories other than injection wells
- Placement of hazardous waste in deactivated missile silos other than injection wells or tanks
- Thermal treatment units other than incinerators, boilers, or industrial furnaces
- OB/OD of waste explosives
- Chemical, physical, biological treatment units.

The Subpart X regulations do not regulate:

- Units regulated under other portions of Parts 264 or 266
- Units excluded from permitting under Parts 264 and 270
- Underground injection wells (Part 146)
- RD&D units covered under Part 270.

PERFORMANCE OBJECTIVES

The Agency concluded that it would be impossible to set technology-based design and operating standards for the enormous diversity of technologies eligible for a permit as a miscellaneous unit. Instead, EPA provided a set of objectives designed to protect groundwater, surface water (including wetlands), air, and soil from the migration of hazardous constituents. The performance objectives require permit applicants to evaluate the potential environmental impacts of the unit or facility and to demonstrate that the unit will not adversely affect human health and the environment (§264.601).

This performance-based regulatory approach offers several advantages. First, it allows the Agency the flexibility to address a full range of environmental issues raised by any waste management situation without the need to develop specific design and operation conditions. Second, for those Subpart X units resembling conventional units, the permit may incorporate appropriate requirements from Subparts I through O, W, and DD, and Part 266, Subpart H. For example, a miscellaneous unit that is similar to a surface impoundment may be required to have liners and a leachate collection system. Third, this approach allows the implementing Agency the flexibility to tailor each permit to meet the particular issues and circumstances based on the technology used, the types of waste, the site location, and the regional meteorological, climatic, and hydrogeologic characteristics.

PERMIT REQUIREMENTS

All owners and operators of miscellaneous units must obtain a permit to treat, store, and/or dispose of hazardous waste. The Subpart X permitting standards require permit applicants to describe the unit and evaluate the potential environmental impacts of the unit or facility (§270.23).

The permit application must include information that clarifies and defines the type of unit for which the owner and operator is seeking a permit. The applicant must describe the unit, its physical characteristics, construction materials, and dimensions. The bulk of the application is expected to contain detailed plans and engineering reports describing the unit location, design, construction, operation, maintenance, monitoring, inspection, and closure.

In addition, each of the environmental performance standards must be assessed. The permit application must contain information on the potential pathways of human or environmental exposure to hazardous waste or hazardous constituents. Where this assessment indicates that releases to air, surface water, or groundwater are possible, the applicant is expected to provide details on the potential magnitude and nature of such exposures, as well as detailed hydrologic, geologic, and meteorologic assessments and maps for the region surrounding the site (§270.23).

MONITORING, ANALYSIS, INSPECTION, RESPONSE, REPORTING, AND CORRECTIVE ACTION

Each miscellaneous unit must have monitoring, testing, analytical data, inspections, response, and reporting procedures. These procedures ensure that a unit is in compliance with the general performance standards. The required activities are included in the unit's permit. At a minimum, the monitoring program must be capable of determining the unit's impact on groundwater, air quality, surface and subsurface contaminant migration; although in many cases, monitoring of a specific medium will not be necessary. It should also ensure compliance with the general inspection requirements, testing and maintenance of equipment schedules, reporting requirements, and corrective action (§264.602).

CLOSURE

Units that cannot clean-close require post-closure care. The unit must meet all of the environmental performance standards, as well as the appropriate post-closure standards of Part 264, Subpart G, during the post-closure care period (§264.603).

3. SPECIAL ISSUES

Keep in mind the following points about how miscellaneous units relate to other RCRA issues.

3.1 MOBILE HAZARDOUS WASTE TREATMENT UNITS

Mobile treatment units (MTUs) are designed to move from facility to facility treating waste on site. These units must comply with the applicable interim status or permitted unit standards. If the MTU does not meet the description of any of the units regulated under Subparts I through O, W, and DD of Part 264 or Subpart H of Part 266, then permitting under Part 264, Subpart X, is required. Current regulations require MTUs to undergo RCRA permit procedures at each site of operation. See the module entitled Permits and Interim Status for more information on permitting MTUs.

3.2 LAND DISPOSAL RESTRICTIONS (LDR)

Many units permitted under Subpart X also meet the definition of a land disposal unit under RCRA (i.e., underground mines or caves). Therefore, any hazardous waste prohibited from land disposal must be treated to meet applicable Part 268 treatment standards prior to placement in the unit.

The Part 268 land disposal restrictions' applicability to OB/OD units requires further clarification. When waste explosives are detonated in RCRA OB/OD units, wastes are typically managed on the ground. The Agency has concluded that OB/OD of waste explosives does not constitute land disposal because it is treatment rather than disposal. This may not be true, however, in cases where the residues from the OB/OD operation remain a hazardous waste. In these cases, the practice of allowing the remaining wastes to remain on the ground or to seep into the ground may be considered land disposal.

3.3 AIR EMISSIONS

When appropriate, a miscellaneous unit's permit must include the air emission control requirements of Subparts AA, BB, and CC. Subpart X miscellaneous units are permitted on a case-by-case basis with terms and provisions as needed to protect human health and the environment. Appropriate portions of the existing technical standards for other waste management units, such as the air emission standards, will be incorporated into a permit as necessary.

FACILITY AUDIT AGREEMENT
between the
ENVIRONMENTAL PROTECTION AGENCY
and
[Insert Name of Hospital]

I. INTRODUCTION

In recognition that environmental auditing plays a critical role in protecting human health and the environment by identifying, correcting, and ultimately preventing violations of environmental regulations, **[Hospital]** and the United States Environmental Protection Agency, Region 2 (the ARegion@) hereby agree that **[Hospital]** shall conduct a self-audit program (the AAudit Program@) for compliance with the regulations promulgated or authorized by the United States Environmental Protection Agency (AEPA@) set forth in Section II below. The Agreement shall be governed by the terms of EPA=s Policy entitled AIncentives for Self-Policing: Discovery, Disclosure, Correction and Prevention of Violations,@ 65 Federal Register 19618 (4/11/00, the APolicy@), except to the extent that those terms are explicitly modified below.

II. SCOPE OF THE AUDIT

A. **[Hospital]** shall conduct an audit (the AAudit@) of its compliance with the regulations cited below in subsections 1 - 6 of Section II.B. The Audit will encompass all **(enter number)** campuses of **[Hospital]**, including any associated off-site facilities, such as ___________ (if applicable). Appendix A, attached hereto, lists the campuses and other units associated with each covered campus (ACovered Campuses@) that are covered by this agreement.

B. Under the Audit Program, **[Hospital]** will audit for compliance with the following federal regulatory programs:

1. Air Programs

Part 511 The New Jersey Implementation Plan Regulations (promulgated pursuant to Section 110 of the Clean Air Act), including the New Source Review regulations 40 CFR Part 52 Subpart HH (52.1670

1 The term “Part” refers to the subdivisions of the subchapters of Title 40 Code of Federal Regulations (“C.F.R.”).

et seq.), New Jersey Administrative Code ("NJAC") 7:27

Part 52	Section 21 Prevention of Significant Deterioration of Air Quality
Part 60	Standards of Performance for New Stationary Sources
Part 61	National Emission Standards for Hazardous Air Pollutants, Subpart M, National Emission Standard for Asbestos
Part 62	Subpart HHH - Federal Plan Requirements for Hospital/Medical/Infectious Waste Incinerators
Part 63	National Emission Standards for Hazardous Air Pollutants for Source Categories (all applicable provisions)
Part 68	Chemical Accident Prevention Provisions
Part 70	State Operating Permit Programs (N.J.A.C. 7:27-22)
Part 82	Protection of Stratospheric Ozone

2. Water Programs

Part 112	Oil Pollution Prevention
Part 122	EPA Administered Permit Programs: The National Pollutant Discharge Elimination System (N.J.A.C. 7:14A)
Part 141	National Primary Drinking Water Regulations (N.J.A.C. 7:10)
Part 142	National Primary Drinking Water Regulations Implementation (N.J.A.C. 7:10)
Part 143	National Secondary Drinking Water Regulations (N.J.A.C. 7:10)
Part 144	Underground Injection Control ("UIC") Program (N.J.A.C. 8)
Part 145	State UIC Program Requirements (N.J.A.C. 7:14A-8)
Part 146	UIC Program: Criteria and Standards (N.J.A.C. 7:14A-8)
Part 147	State UIC Programs (N.J.A.C. 7:14A-8)
Part 148	Hazardous Waste Injection Restrictions (N.J.A.C. 7:14A-8)
Part 403	General Pretreatment Regulations for Existing and New Sources of Pollution (N.J.A.C. 7)

3. Pesticide Programs

Part 160	Good Laboratory Practice Standards
Part 162	State Registration of Pesticide Products
Part 170	Worker Protection Standard
Part 171	Certification of Pesticide Applicators
Part 172	Experimental Use Permits

4. Solid and Hazardous Wastes

Part 260 Hazardous Waste Management System:General (N.J.A.C.7:26 G-4) [2]
Part 261 Identification and Listing of Hazardous Waste (N.J.A.C. 7:26G-5)
Part 262 Standards Applicable to Generators of Hazardous Waste (N.J.A.C. 7:26G-6)
Part 263 Standards Applicable to Transporters of Hazardous Waste (N.J.A.C. 7:26G-7)
Part 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (N.J.A.C. 7:26G-8)
Part 265 Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (N.J.A.C. 7:26G-9)
Part 266 Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities (N.J.A.C. 7:26G-10))
Part 268 Land Disposal Restrictions (N.J.A.C. 7:26G-11)
Part 273 Standards for Universal Waste Management
Part 279 Standards for the Management of Used Oil
Part 280 Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks ("USTs")

5. Hazardous Substances and Chemicals, Environmental Response, Emergency Planning, and Community Right-to-Know Programs

Part 302 Designation, Reportable Quantities, and Notification
Part 355 Emergency Planning and Notification
Part 370 Hazardous Chemical Reporting: Community Right-to-Know
Part 372 Toxic Chemical Release Reporting: Community Right-to-Know

6. Toxic Substances

Part 745 Lead-Based Paint Poisoning Prevention in Certain Residential Structures
Part 761 Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions
Part 763 Asbestos

2 New Jersey has been authorized by the Region for many of the federal regulations comprising Parts 260 - 268. Once authorized, a state regulation becomes the applicable regulation. [Resource Conservation and Recovery Act ("RCRA"), as amended, §3006(b), 42 U.S.C. §6926(b)]. For purposes of this Agreement **[Hospital]** will audit for compliance with authorized New Jersey State counterparts of the federal regulations, where applicable.

C. The types of facilities and documents to be audited on the Covered Campuses are set forth in Appendix B. The benefits of this Agreement shall extend to only those facilities within the Covered Campuses that are audited.

III. DISCLOSURE

[Hospital] shall disclose all EPA-enforceable regulatory violations discovered during the Audit. **[Hospital]** will disclose these violations to the Region, in accordance with the Policy, in written disclosure reports to be submitted in accordance with the schedule set forth below in Section IV. Each such disclosure report shall contain, with reference to each violation disclosed, the following additional information: the actions selected by **[Hospital]** to correct the violation within 60 days, or as otherwise approved pursuant to Section V below; the status of the corrective action; and the means taken by **[Hospital]** to prevent recurrence of the violation. All disclosure reports will be submitted by the scheduled date, and the Region agrees to waive the 21-day disclosure requirement provided for in the Policy.

Once the action designed to correct a particular violation has been completed, and a report submitted to the Region notifying it of the completion of the corrective action, no further reporting on that violation, or the status of corrective action, is required. On **[Date of Termination of Agreement - usually sixty days after submittal of last disclosure report]**, this Agreement shall terminate for all purposes, except that **[Hospital]** shall remain obligated to complete the action necessary to correct any disclosed violation, and to report to the Region in writing the completion of any corrective action, previously unreported, within thirty days after such corrective action has been completed.

This Audit Agreement does not cover any pre-Agreement activities, including regulatory compliance issues discovered by **[Hospital]** or its environmental consultant(s) prior to the effective date of this Agreement.

IV. SCHEDULE

A. Within 10 days of the effective date of this agreement, **[Hospital]** will identify suitable personnel or consultants (where appropriate) to perform each of the six regulatory program audits identified in Section II above and shall further identify the applicable criteria pursuant to which each such regulatory program audit shall be conducted. **[Hospital]** shall submit to EPA the audit protocols and audit checklists for each of the six regulatory program audits, tailored to the Hospital, and shall provide copies of these audit instruments to the Region. **[Hospital]** is willing to share any materials it develops with other healthcare institutions and the Region.

B. Within 30 days of the signing of the agreement, the Audit shall commence.

C. **[Hospital]** shall complete the regulatory audits required by the Sections listed in this agreement, and shall submit disclosure reports to the Region, in accordance with the Policy and the Agreement, identifying all EPA-enforceable violations discovered during the course of these audits according to the schedule set forth in Appendix C.

V. CORRECTIVE ACTION

[Hospital] shall correct each violation identified during the Audit, and shall take steps necessary to prevent the recurrence of each such violation. Wherever possible, **[Hospital]** shall correct any violations identified during the Audit within 60 days of discovery. In those instances in which **[Hospital]** is unable to correct an identified violation within the 60-day deadline, it shall request an extension of time from the Region in writing and provide a correction schedule, accompanied by a justification of the requested extension. Any extension of the 60-day correction period shall be subject to the Region's approval. Such approval will not be unreasonably withheld.

If **[Hospital]** discovers or otherwise becomes aware of a concern or concerns that may present an imminent and substantial endangerment to human health or the environment, and such concern(s) may exist at other **[Hospital]** campuses covered by this Agreement, notwithstanding any other language herein to the contrary, **[Hospital]** agrees to address such concern(s) at all covered campuses as expeditiously as possible and promptly take such action as may be necessary at all covered campuses to protect human health and the environment. **[Hospital]** shall notify EPA (initial notice may be by phone) of such concern(s) within 24 hours of discovery or becoming aware of such concern(s) and shall notify EPA in writing within five business days of such discovery of **[Hospital]**'s proposed remedial action.

VI. CIVIL PENALTIES FOR DISCLOSED VIOLATIONS

Except as provided in Section II.D.8 of the Policy, the Region will not impose gravity-based penalties for violations voluntarily discovered if they are timely disclosed and corrected, and provided that the applicable provisions of the Policy and this Agreement are met. The Region will consider the least expensive means for coming into compliance for calculating potential economic benefit penalties for any disclosed violations, provided that such methods comply with regulatory requirements.

VII. REGIONAL INSPECTIONS

The Region will assign a low priority for compliance inspections at the Covered Campuses until after the completion of the Audit, except with respect to potential violations of regulatory provisions, or at facilities, that are outside the scope of the Audit, as defined in Section II above, or where: the Region has received a citizen=s complaint; the Region has reason to believe that circumstances exist that may pose a threat of actual harm or an imminent and substantial endangerment to public health or the environment; the Region has reason to believe that a criminal violation may, or has occurred; or where **[Hospital]**, pursuant to statute, has notified the National Response Center of a release. Any civil violation discovered in a facility or unit within the scope of the Audit, that was scheduled to be audited subsequent to such discovery, shall be treated as a disclosure by **[Hospital]** and resolved under the terms of the Policy and this Agreement. Additionally, the Region retains the right to conduct during the Audit the inspections set forth in subsections A and B immediately below:

A. Oversight Inspections: Where **[Hospital]** has reported a violation that requires corrective action in the nature of a clean-up of contamination, the Region shall have the right to conduct inspections at the corrective action site for the purpose of overseeing or monitoring the clean-up, to assure correction of the violation. No civil penalties shall be associated with or result from oversight inspections, unless circumstances exist that may pose a threat of actual harm or an imminent and substantial endangerment to public health or the environment.

B. Confirmation Inspections: Where **[Hospital]** has disclosed a violation, selected a corrective action plan, and reported that the plan has been completed and the violation cured, the Region shall have the right to inspect the relevant facility or site to assure that the violation has in fact been corrected, or to require further appropriate corrective action, if it has not. No civil penalties shall be associated with or result from confirmation inspections, unless circumstances exist that may pose a threat of actual harm or an imminent and substantial endangerment to public health or the environment.

VIII. MISCELLANEOUS PROVISIONS

A. Notification and Certification of Disclosure Reports: **[Hospital]** designates as its Aresponsible official,@ responsible for submitting disclosure reports to the Region, the following individual:

Name of Responsible Official
Title
Name of Hospital
Address
City, State, Zip Code
Phone Number

Fax Number

The responsible official shall certify that each disclosure report submitted to the Region is true, accurate and complete in the form set forth in 40 C.F.R. '270.11(d).

[Hospital] designates as its Acontact person,@ to be the recipient of all communications from the Region concerning this Agreement, the following individual:

Name of Contact Person
Name of Hospital
Address
City, State, Zip Code
Phone Number
Fax Number
Email Address

The Region designates the following individual as its contact person:

Charles Zafonte
Multimedia Enforcement Coordinator
DECA/CAPSB
U.S. Environmental Protection Agency, Region 2
290 Broadway (21ST Floor)
New York, New York 10007-1866
Phone: (212) 637-3515
Fax: (212) 637-4086
zafonte.charles@epa.gov

The parties may redesignate their contact person and responsible official in writing.

B. Compliance With Law and Regulation: Neither the existence of this Agreement, nor compliance with this Agreement relieves **[Hospital]** of its obligation of continued compliance with the regulations covered by this Agreement, and all other federal, state and local laws and regulations.

C. Reservation of Right: The Region reserves its right to proceed against **[Hospital]** for all violations outside the scope of the Audit, and violations within the scope of the Audit that were not timely reported or timely corrected. In any enforcement proceeding, the Region may enforce the provision of 40 C.F.R. allegedly violated, or its New Jersey-authorized or -approved counterpart, if said state counterpart is federally enforceable as a matter of law.

D. Authority of Signatories: The signatories hereto represent that they have the authority to bind the parties.

E. Modification: This Agreement may be modified by a writing signed by both parties.

F. Coordination With the State Environmental Agency: The Region has informed the New Jersey Department of Environmental Protection (NJDEP) of this Agreement and shall provide a copy to NJDEP. Nothing herein restricts NJDEP from acting as it deems appropriate.

WE, THE UNDERSIGNED, HEREBY AGREE TO BE BOUND BY THIS AGREEMENT:

For **[Hospital]**:

Name of Responsible Official
Title
Address
City, State, Zip Code

Date:

For EPA - Region 2:

Jane M. Kenny, Regional Administrator
USEPA - Region 2
290 Broadway
New York, New York 10007

Date:

Appendix A

Covered Campuses and Off-Site Facilities Associated with Those Campuses

[List of Campuses and off-site facilities covered under the Audit Agreement goes here.]

Appendix B

SCOPE OF AUDIT PROGRAM

The following list provides the activities, areas, and/or shops that the review of the campus(es) must cover. This list not meant to be all-inclusive. [Please select and include areas that exist at your campus.]

Documents to Review (for the three years prior to the Program Period)

_ Verify EPA identification numbers and permits
_ Hazardous waste manifests
_ Training records
_ Land disposal restriction notifications
_ Exception reports
_ Lead disclosure statements in leases, or associated with leases of residential housing let by the university in its capacity as a lessor, as defined in 40 C.F.R. ' 745.103
_ Contingency plans and annual reports (for contingency plans, only the current plan will be reviewed)
_ Required certifications

Facilities Operation and Maintenance

_ Air conditioning/refrigeration service
_ Appliance and equipment repair, including medical equipment
_ Building cleaning and maintenance
_ Building renovation and construction
_ Cafeteria
_ Chemical storage areas
_ Drinking water treatment systems
_ Fabrication shops
_ Furniture repair
_ Heating and power plants (e.g., boilers, emergency generators)
_ House or architectural structure painting
_ Landscaping operations
_ Laundry
_ PCB transformers and switches
_ Pesticide storage facilities
_ Resource recovery/incinerator facilities
_ Waste disposal areas (landfills)
_ Wastewater treatment facilities
_ Waste treatment facilities such as autoclaves

Fleet Maintenance

- Automotive, truck, and ambulance servicing areas
- Gasoline service stations
- Garages

Hazardous Waste / Tanks / Wells

- Aboveground and current operating underground storage tanks and their containment areas/systems, and documentation concerning closures of regulated tanks previously removed from service.
- Dry wells, septic systems, cesspools, floor drains, sink drains, and disposal wells.
- Facilities treating, storing or disposing of hazardous wastes.
- Hazardous waste satellite accumulation areas.
- Hazardous waste storage areas.
- Tanks that have been permanently or temporarily closed.
- Transformers and oil-containing electrical equipment (PCB and non-PCB).
- Universal waste storage areas.

Laboratories

- All clinical, pathology and dental laboratories
- All teaching and research laboratories with regular chemical use.

Patient Care

- Anesthesiology
- Chemotherapy
- Dentist's offices
- Doctor's offices
- Floor Pharmacies
- Histology
- Intensive Care Units
- Neonatal Areas
- Nursing Stations
- Operating Rooms
- Pathology, microbiology
- Patient's Rooms
- Patient treatment areas
- X-Ray/Radiology

Main Pharmacy

- Storage areas
- Outdated pharmaceuticals

Sterile Supply and Materials Management

_ Autoclaving Units
_ Ethylene Oxide (EtO) Units
_ Glutaraldehyde
_ Use and disposal of disinfectants

Use and Disposal of Known Chemicals/Products of Concern

_ Computers/monitors, circuit boards, and other lead-bearing electronics
_ Ethanol and formaldehyde/ethanol solutions
_ Fluorescent light bulbs and other types of lamps, including high-intensity discharge, neon, mercury vapor, high pressure sodium, and metal halide lamps
_ Formaldehyde/Formalin
_ Mercury and Mercury-containing devices and products
_ PVC-containing devices
_ Xylene
_ Batteries
_ Solvents
_ Photographic chemicals and scrap film

Other Services

_ Athletic and training facilities
_ Photo processing/publishing
_ Morgue/Crematorium
_ Animal care areas

Appendix C

SCHEDULE OF AUDITS

[Insert a schedule of when audits will be done at each campus/location. Provide details, as necessary, such as deadlines for submitting the disclosure report, the regulatory areas being audited, and the names of campuses, buildings, or other location-specific info.]

Example:

Location	Programs to be Audited, if not all programs that are identified in Section II.	Date Disclosure Report will be Submitted to EPA
Campus A, e.g.: Pharmacy Physical Plant Print Shop	e.g., RCRA, CWA	

Solid Waste and Emergency Response
(5305W)
EPA530-K-05-015

RCRA Training Module

Introduction to

Municipal Solid Waste Disposal Facility Criteria

EPA
United States
Environmental Protection
Agency

September 2005

SUBTITLE D: MUNICIPAL SOLID WASTE DISPOSAL FACILITY CRITERIA

CONTENTS

1. INTRODUCTION

This module provides a summary of the regulatory criteria for municipal solid waste landfills (MSWLFs). In general, a MSWLF is a landfill that accepts garbage, or solid waste, from households. Wastes that are typically landfilled include bottles, cans, disposable diapers, uneaten food, scraps of wood and metal, newspapers, paper and plastic packaging, and old appliances, as well as some industrial and commercial nonhazardous wastes and construction and demolition (C&D) wastes. MSWLFs may also accept household hazardous wastes and conditionally exempt small quantity generator (CESQG) wastes that are not regulated as hazardous wastes under Subtitle C of the Resource Conservation and Recovery Act (RCRA).

The MSWLF regulations promulgated on October 9, 1991 address location restrictions, facility design and operation standards, groundwater monitoring and corrective action measures, closure and post-closure care, and financial responsibility requirements (56 FR 50978). Implementation of these regulations, by states with approved programs, will reduce the environmental impact of existing and future MSWLFs.

When you have completed this module, you will be able to summarize the standards for MSWLFs and list the relevant statutory and regulatory citations. Specifically, you will be able to:

- provide the statutory authority under RCRA and the Clean Water Act (CWA) directing EPA to develop the MSWLF criteria in 40 CFR Part 258

- provide the Part 258 effective date and the compliance dates for providing demonstrations to satisfy individual regulatory requirements

- identify the types of facilities that qualify for the small landfill exemption

- explain the requirements of each subpart in Part 258 as they apply to states with EPA-approved MSWLF permit programs and states without approved permit programs

- compare the MSWLF environmental performance standards described in Part 258 to the corresponding requirements for hazardous waste management facilities in Part 264, which are generally more stringent.

Use this list of objectives to check your knowledge of this topic after you complete the training session.

2. REGULATORY SUMMARY

RCRA Subtitle D addresses solid waste management and was designed to assist waste management officials in developing and encouraging environmentally sound methods for the disposal of "nonhazardous" solid waste (RCRA §4001). Promulgated under the authority of Subtitle D, the MSWLF regulations in Part 258 establish a framework at the federal level for planning and implementing municipal solid waste landfill programs at the state and local levels. This framework sets minimum standards for protecting human health and the environment, while allowing states to develop more flexible MSWLF criteria.

The Part 258 standards are intended to provide the means to mitigate or expeditiously remediate potential adverse environmental impacts resulting from municipal landfills. However, other Subtitle D regulations existed prior to the revised MSWLF standards discussed in this module. RCRA §4004(a) authorized the promulgation of Part 257, Criteria for Classification of Solid Waste Disposal Facilities and Practices (44 FR 53438; September 13, 1979). Part 257 established regulatory standards to satisfy the minimum national performance criteria for sanitary landfills. Since Part 258 became effective on October 9, 1993, Part 257 governs only those solid waste disposal facilities and practices that do not meet the definition of a MSWLF. Such facilities include waste piles, industrial nonhazardous waste landfills, surface impoundments, and land application units. EPA modified the Part 257 criteria on July 1, 1996, to address the fact that these non-municipal non-hazardous wastes landfills may receive CESQG hazardous waste (61 FR 34252). EPA revised Part 257 to further clarify that construction and demolition landfills may receive residential lead-based paint waste as Solid Waste Disposal Facilities without having to comply with the Part 258 standards for MSWLFs as long as all conditions are met (68 FR 36487; June 18, 2003). See the training module entitled Solid Waste Programs for further information.

Section 4010 of the Hazardous and Solid Waste Amendments of 1984 (HSWA) authorized EPA to revise its existing sanitary landfill criteria to establish specific regulations for facilities that receive household hazardous waste or CESQG hazardous waste. In response to §4010, EPA promulgated regulations on October 9, 1991 and added Part 258 requirements to address all aspects of MSWLF design and management (56 FR 50978). EPA designed the Part 258 requirements to be self-implementing, meaning that in unapproved states the owner and operator of a MSWLF can meet these standards without the oversight of the state agency. These revised, performance-based standards enable implementing agencies to strike a balance between environmental protection, cost, and site-specific factors. Integral to this regulatory approach is the significant flexibility granted to approved states for developing site-specific controls.

Since municipal solid waste management is more amenable to State and local, rather than federal, regulatory oversight, EPA intends for states to take the lead role in implementing the MSWLF regulations. EPA's goal is for states to receive approval of their MSWLF programs. States with approved programs are given flexibility to consider site-specific conditions regarding MSWLF design and other requirements in Part 258. If a state does not have an approved program, there is no mechanism by which a regulatory agency can exercise flexibility in implementing the Part 258 requirements.

This flexibility is a factor that motivates states to submit applications for approval of their programs as quickly as possible. EPA promulgated the State Implementation Rule (SIR) to encourage states to receive program approval and take advantage of this flexibility. SIR, finalized on October 23, 1998, provides a flexible framework for modifications of approved programs, establishes procedures for withdrawals of approvals, and confirms the process for future program approvals (63 FR 57026).

Throughout this module, the text will refer to the titles "State Director," meaning the chief administrative officer responsible for implementing the state municipal solid waste permit program, and "Director of an approved state," meaning the chief administrative officer responsible for implementing the state municipal solid waste permit program that is approved by EPA under §§2002 and 4005 of RCRA.

2.1 SUBPART A: GENERAL REQUIREMENTS

The Part 258 standards establish minimum national criteria under RCRA for all MSWLFs to ensure protection of human health and the environment. A MSWLF unit is a discrete area of land or an excavation that (1) receives household waste and (2) may not otherwise be defined as a land application unit, surface impoundment, injection well, or waste pile. A MSWLF unit may also receive other types of RCRA Subtitle D wastes, such as commercial solid waste, nonhazardous sludge, CESQG waste, and industrial solid waste. Such a landfill may be publicly or privately owned.

A MSWLF unit may be a new MSWLF unit, an existing MSWLF unit, or a lateral expansion. Any MSWLF unit that has not received waste prior to October 9, 1993, is a new MSWLF unit. An existing MSWLF unit means any MSWLF unit that was receiving solid waste as of the effective date, October 9, 1993, of the final rule (56 FR 50978; October 9, 1991). A landfill cell could constitute an individual MSWLF unit. A lateral expansion is a horizontal expansion of the waste boundaries of an existing MSWLF unit.

Units accepting municipal solid waste that do not meet the Part 258 criteria are classified as open dumps, and are prohibited by RCRA §4005(a). Accordingly, such units must be upgraded or closed.

EFFECTIVE DATES

Part 258 applies to owners and operators of new and existing MSWLFs and lateral expansions that receive waste after October 9, 1991. Owners and operators of units that ceased receiving waste between October 9, 1991, and October 9, 1993, only needed to comply with the final cover requirements in §258.60(a) (§258.1(d)). Compliance for these landfills entailed placing a final cover on the unit by October 9, 1994. Owners and operators who failed to comply with these final cover requirements by October 9, 1994, like those whose units continued to receive waste after October 9, 1993, needed to comply with all applicable Part 258 standards.

On October 1, 1993, EPA issued a rule delaying the effective date for certain existing smaller MSWLFs to April 9, 1994 (58 FR 51536). To qualify for the extension, the MSWLF units had to accept 100 tons per day or less during a representative period prior to October 9, 1993, not be on the Superfund National Priorities List (NPL), and be located in a state that had submitted an application for state program approval by October 9, 1993; or be located on Indian lands or Indian country. MSWLFs qualifying for the extension were still required to install a final cover by October 9, 1994.

The effective date may also have been extended to April 9, 1994, for existing MSWLFs, regardless of size, in Midwest flood regions if a landfill owner and operator's state determined that an extension was needed to manage flood-related waste from federally designated disaster areas during the summer of 1993. These states were allowed six additional months beyond April 9, 1994, to comply with the federal regulations. The nine states within federal disaster areas were Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, and Wisconsin. Compliance dates for meeting individual regulatory requirements are listed in Figure 1.

SMALL LANDFILL EXEMPTION

When the landfill criteria were developed in the late 1980s, EPA determined that nearly half of the MSWLFs in the United States were small facilities serving communities of approximately 10,000 people or less (57 FR 50989; October 9, 1991). Because of the financial impact of the regulations on these facilities, EPA included in the final 1991 criteria an exemption for certain small MSWLFs from the requirements in Subpart D (design criteria) and Subpart E (groundwater monitoring) (§258.1(f)(1)). In 1993, EPA was subsequently sued and required to remove the groundwater monitoring exemption. In March 1996, the Land Disposal Program Flexibility Act (LDPFA) of 1996 was signed into law, reinstating the groundwater monitoring exemption for qualifying small landfills. This exemption was codified on September 25, 1996 (61 FR 50410). To qualify for this exemption, a unit must receive less than 20 tons of municipal solid waste daily based on an annual average, and must serve either:

- a community that experiences an annual interruption of at least 3 consecutive months of surface transportation that prevents access to a regional waste management facility; or

- a community that has no practical waste management alternatives, and the landfill is an area that annually receives less than or equal to 25 inches of precipitation.

In addition, there must be no evidence of existing groundwater contamination from the unit for the small landfill exemption to apply. If evidence of groundwater contamination from an exempted small landfill is discovered, the owner and operator must notify the State Director and thereafter fully comply with Subparts D and E (§258.1(f)(3)). MSWLF units meeting the small landfill exemption in §258.1(f) are exempt from all applicable regulations until October 9, 1997.

RESEARCH, DEVELOPMENT, AND DEMONSTRATION PERMITS

To promote innovative technologies, EPA published a final rule on March 22, 2004 (69 FR 13242), to revise the criteria for MSWLFs to allow states to issue research, development, and demonstration (RD&D) permits to new and existing MSWLF units and lateral expansions. The Director of an approved state may provide owners and operations variances from certain

MSWLF criteria provided that compliance with the RD&D permit will not increase risk to human health and the environment. The specific criteria that are eligible for the variances are the run-on control systems in §258.26(a)(1), the liquid restrictions in §258.28(a), and the final cover requirement in §258.60(a). No other variances from the criteria, unless already provided in the existing regulations, are allowed under the RD&D permit.

Figure 1

SUMMARY OF CHANGES TO THE EFFECTIVE DATE OF THE MSWLF CRITERIA

	MSWLF units accepting greater than 100 TPD	**MSWLF units accepting 100 TPD or less; not on the NPL; and located in a state that has submitted an application for approval by 10/9/93, or on Indian lands or Indian country**	**MSWLF units that meet the small landfill exemption in 40 CFR §258.1(f)**	**MSWLF units receiving flood-related waste**
General effective date[1,2,3] ***This is the effective date for location, operation, design, and closure/post-closure standards.***	October 9, 1993	April 9, 1994	October 9, 1997; exempt from design requirements	Up to October 9, 1994, as determined by state
Date by which unit must install final cover if it ceases receipt of waste by the general effective date[2,3]	October 9, 1994	October 9, 1994	October 9, 1998	Within one year of date determined by state; no later than October 9, 1995
Effective date of groundwater monitoring and corrective action provisions[2,3]	Prior to receipt of waste for new units; October 9, 1994 through October 9, 1996 for existing units and lateral expansions	October 9, 1993 for new units; October 9, 1994 through October 9, 1996 for existing units and lateral expansions	Exempt from the groundwater monitoring requirements.[5]	October 9, 1993 for new units; October 9, 1994 through October 9, 1996 for existing units and lateral expansions
Effective date of financial assurance requirements[3,4]	April 9, 1997	April 9, 1997	October 9, 1997	April 9, 1997

[1] If a MSWLF unit receives waste after this date, the unit must comply with all of Part 258.
[2] See the final rule and preamble published on October 1, 1993 (58 FR 51536) for a full discussion of all changes and related conditions.
[3] See the final rule and preamble published on October 6, 1995 (60 FR 52337) for a full discussion of all changes and related conditions.
[4] See the final rule and preamble published on April 7, 1995 (60 FR 17649) for a discussion of this delay.
[5] See the final rule published on September 25, 1996 (61 FR 50410).

2.2 SUBPART B: LOCATION RESTRICTIONS

The regulations establish special siting restrictions and performance standards for six types of MSWLF site locations: airports, 100-year floodplains, wetlands, fault areas, seismic impact zones, and unstable areas (Part 258, Subpart B). These six types of locations are sensitive areas that warrant additional regulatory controls. While all six location restrictions apply to new and laterally expanding MSWLF units, existing units are subject only to airport safety, floodplain, and unstable area controls.

Unless the owner and operator of an existing MSWLF unit can make all applicable demonstrations required for airport controls (§258.10(a)), floodplains (§258.11(a)), and unstable areas (§258.15(a)), the unit must close by October 9, 1996, in accordance with §258.60. The owner and operator must also conduct post-closure activities in accordance with §258.61, as required by §258.16. Approved states may delay the October 1996 closure date by up to two years.

Because these landfill siting regulations involve substantial geological investigation, certain terms used in the regulations are unusually technical. Refer to Part 258, Subpart B, for definitions of specific terms.

AIRPORT SAFETY CONTROLS

Landfills can attract birds seeking food or nesting sites; therefore, landfills that are located near an airport may pose a risk of collisions between birds and aircraft. The airport safety restrictions in §258.10 define a danger zone in which special care must be taken to ensure that the likelihood of collisions between birds and aircraft is reduced (56 FR 50978, 51043; October 9, 1991). These provisions apply to new MSWLFs, existing MSWLFs, and lateral expansions located within 10,000 feet of any airport runway used by turbojet aircraft, or within 5,000 feet of any runway end used by piston-type aircraft only. The owner and operator of any unit located within these areas must demonstrate that the management practices of the landfill will minimize the incidents of bird hazards for aircraft.

Provided the owner and operator can make this demonstration, the airport safety criteria do not prohibit the disposal of solid waste within the specified distances. Likewise, the airport safety restrictions do not impact the location of airports or airport runways. In accordance with Federal Aviation Administration (FAA) Order 5200.5A, however, municipal landfills and lateral expansions proposed within a five-mile radius of any airport runway end used by turbojet or piston-type aircraft must notify the affected airport and the FAA in writing of such a proposal (§258.10(b)).

The Aviation Investment and Reform Act for the 21st Century (P.L. 106-181), which includes provisions that amend the MSWLF location criteria, was signed into law on April 5, 2000. The amendments come after Congress found that collisions between aircraft and birds have resulted in fatal accidents and pose special dangers to smaller aircraft. Since landfills have an inherent nature to attract birds, the law prohibits the location of new MSWLFs within six miles of airports served by general aviation aircraft and regularly scheduled flights of aircraft designed for 60 passengers or less. This restriction does not apply to existing landfills or expansions of existing landfills.

EPA published a direct final rule on July 11, 2002 (67 FR 45915), to amend the MSWLF location restriction criteria to incorporate the language of Aviation Investment and Reform Act. However, EPA subsequently withdrew this rule on October 8, 2002 (67 FR 62647), after receiving adverse comments. Finally, an informative note was added to §258.10 on October 15, 2003 (68 FR 59335), to reference the FAA guidance governing this restriction.

FLOODPLAIN CONTROLS

Floodplain regulations establish guidelines that must be followed when a new or existing MSWLF or a lateral expansion is located in a 100-year floodplain. A unit subject to these provisions must be designed and operated to minimize its effect on both the 100-year flood flow and the temporary water storage capacity of the floodplain. The unit's owner and operator must provide evidence that the landfill will not restrict the flow of the 100-year flood, reduce the temporary water storage capacity of the floodplain, or result in washout of solid waste.

WETLANDS CONTROLS

Swamps, bogs, marshes, and other wetlands are unique, critical ecosystems that serve an important role in flood control, help filter wastes from water, provide an important breeding ground for fish and wildlife, and constitute an important recreational resource. EPA has placed a high priority on wetlands protection, but believes an outright ban of new MSWLFs or lateral expansions in wetlands could severely restrict the sites available for new or expanding landfills. Thus, the Agency developed guidelines for the limited siting of MSWLFs in wetlands.

New units or lateral expansions are banned from wetlands unless the owner and operator make the following demonstrations to the Director of an approved state:

- rebut the presumption that a practicable alternative site is available
- show that landfill construction and operation will not violate certain state and federal standards designed to protect water quality and wildlife
- demonstrate that the MSWLF unit will not cause or contribute to significant degradation of wetlands
- demonstrate that steps were taken to achieve no net loss of wetlands.

Because these demonstrations must satisfy the Director of an approved state, §258.12(a) effectively bans the siting of new MSWLF units and lateral expansions in wetlands in unapproved states.

The Agency intends to keep these wetlands location restrictions consistent with all CWA regulatory modifications. As §404 of the CWA evolves in accordance with the wetlands protection program, EPA will modify relevant portions of §258.12 accordingly (56 FR 51045; October 9, 1991).

FAULT AREA CONTROLS

Fault area restrictions ban the siting of new MSWLFs and lateral expansions within 200 feet of a fault that has experienced displacement in Holocene time (i.e., the past 11,000 years). This restriction reflects the Agency's belief that, in general, a 200-foot buffer zone is adequate to protect engineered structures, such as a new MSWLF, from seismic damage (56 FR 51046; October 9, 1991). In a state with an approved permitting program, however, the owner and operator may demonstrate that a setback distance less than 200 feet will prevent damage to the structural integrity of the unit and will be protective of human health and the environment.

SEISMIC IMPACT ZONES

In unapproved states, new MSWLFs and lateral expansions cannot be sited in a seismic impact zone, as defined in §258.14(b)(1). In a state with an approved permitting program, however, a MSWLF may be located in a seismic impact zone if the owner and operator can prove that all containment structures, liners, leachate collection systems, and surface water control systems are designed to resist the anticipated movement in geologic features at the site.

UNSTABLE AREA CONTROLS

Any location susceptible to events or forces capable of impairing a landfill's structural integrity is classified as an unstable area. Owners and operators must assess on-site and local factors, including soil conditions and geologic features, to determine whether an area is unstable. Unstable areas can include poor foundation conditions, areas susceptible to mass movement, and karst topography (§258.15(b)(3), (4), and (5)). New and existing MSWLFs and lateral expansions must not be located in an unstable area unless the owner and operator can demonstrate that engineering measures in the unit's design are sufficient to ensure that the integrity of structural components (e.g., composite liner and final cover) will not be disrupted (§258.15(a)).

2.3 SUBPART C: OPERATING CRITERIA

Operating criteria are controls for the day-to-day management of a MSWLF. For example, owners and operators must have a program in place to exclude regulated quantities of hazardous waste and polychlorinated biphenyl (PCB) wastes. Additional requirements include daily cover material, controlling disease vector populations (such as rodents and mosquitoes), restricting public access, and maintaining appropriate records. The operating criteria are summarized below.

PROCEDURES FOR EXCLUDING THE RECEIPT OF HAZARDOUS WASTE

All MSWLF unit owners and operators must institute a program to detect and prevent the disposal of regulated quantities of PCB wastes and RCRA hazardous wastes (except from CESQGs) (§258.20(a)). Facility personnel must be trained to identify regulated hazardous waste and PCBs and the owner and operator must either conduct random inspections of wastes brought to the facility, or take other steps to ensure that incoming loads do not contain regulated hazardous wastes or PCBs (e.g., arranging pre-acceptance agreements with haulers).

Upon detection of hazardous or PCB wastes, the owner and operator must notify the State Director or Regional Administrator. Even if the owner and operator receive the waste accidentally, they are responsible for ensuring that regulated hazardous waste is treated, stored, or disposed of in accordance with all applicable RCRA Subtitle C and state requirements (57 FR 51050; October 9, 1991).

COVER MATERIAL REQUIREMENTS

Exposed waste at landfills contributes to a range of health, safety, and aesthetic problems, such as disease vectors, fires, odors, blowing litter, and waste scavenging. To control these problems, §258.21 requires that at the end of each operating day, a cover of at least six inches of soil be placed over exposed waste in a MSWLF (§258.21). In states with approved permitting programs, the State Director is authorized to allow alternative cover materials or thicknesses, or to grant temporary waivers from the daily cover requirement if extreme seasonal weather conditions, such as heavy snow or severe freezing, make meeting this requirement impractical (56 FR 51051; October 9, 1991).

Section 258.21 was revised on July 29, 1997, consistent with the Land Disposal Program Flexibility Act (LDPFA) (62 FR 40708). The revision provides additional flexibility to approved states, allowing the Director of an approved state, after public review and comment, to establish alternative frequencies for daily cover for certain small MSWLFs, provided that the Director takes into account climatic and hydrogeologic conditions and determines that the alternative requirements are protective of human health and the environment.

DISEASE VECTOR CONTROL

Disease vectors are rodents, flies, mosquitoes, or other animals and insects capable of transmitting disease to humans (§258.22(b)). As stated above, one purpose for the daily cover requirement is to prevent the facility from becoming a breeding ground, habitat, or feeding area for disease vector populations. If compliance with the daily cover material requirement is insufficient to ensure disease vector control, the facility owner and operator must employ additional methods (e.g., shredding the waste) to protect human health and the environment.

EXPLOSIVE GASES CONTROL

The decomposition of organic waste produces methane gas. High concentrations of methane in MSWLF structures or the facility area create an explosion hazard for employees, facility users, and occupants of nearby structures. To mitigate potential hazards, a routine methane monitoring program, conducted at least quarterly, must be implemented in accordance with §258.23(b) to ensure that the following conditions are maintained:

- in facility structures, the concentration of methane gas must not exceed 25 percent of the lower explosive limit for methane as defined in §258.23(d)
- at the facility property boundary, the concentration of methane gas must not exceed the lower explosive limit.

While §258.23(c) outlines the procedures that the owner and operator must follow if these methane levels are exceeded, states with approved programs may establish alternative response procedures (§258.23(c)(4)).

Consistent with the LDPFA, §258.23 was revised on July 29, 1997, to incorporate a provision allowing the Director of an approved state, after public review and comment, to establish alternative frequencies of methane monitoring for any small MSWLFs, provided that the Director takes into account climatic and hydrogeologic conditions and determines that the alternative requirements are protective of human health and the environment (62 FR 40708).

AIR CRITERIA

In general, air emissions from MSWLFs are regulated under the Clean Air Act (CAA), not under RCRA (56 FR 51053; October 9, 1991). Nevertheless, §258.24 prohibits open burning of nearly all solid wastes at MSWLFs; only the infrequent burning of agricultural wastes, silvicultural (forestry) wastes, land-cleaning debris, diseased trees, and debris from emergency cleanup operations is permitted (§258.24(b)). Additionally, landfill gas performance standards for new landfills and guidelines for existing landfills were promulgated under the authority of the CAA on March 12, 1996 (61 FR 9905). EPA published on January 16, 2003 (68 FR 2227), the National Emission Standards for Hazardous Air Pollutants (NESHAPS) for MSWLFs.

ACCESS REQUIREMENTS

Access to MSWLF facilities must be controlled to prevent unauthorized people from entering the MSWLF. Owners and operators of all MSWLFs may use artificial or natural barriers, as necessary, to control public access to the facility and prevent unauthorized vehicular traffic and illegal dumping of wastes (§258.25).

RUN-ON AND RUNOFF CONTROL SYSTEMS

To prevent the flow of surface water onto or from a landfill unit, §258.26 requires all MSWLF units to have run-on and runoff control systems. The intent of the design, construction, and maintenance of a run-on control system is to prevent the flow of surface water onto the active portion of a unit during the period of greatest precipitation in a 25-year storm. These system controls are intended to mitigate erosion, reduce surface discharge of wastes in solution or suspension, and minimize run-on available to percolate down through waste that creates leachate (56 FR 51054; October 9, 1991). A runoff control system, likewise, must be designed and operated to collect and control the water volume resulting from a 24-hour, 25-year storm (§258.26(a)(2)).

SURFACE WATER REQUIREMENTS

The runoff control measures would be largely undermined if collected waters were improperly managed. Runoff collected from the active portion of a landfill unit must be managed in accordance with §258.27, which requires that all MSWLFs be operated in compliance with the Clean Water Act.

BULK OR NONCONTAINERIZED LIQUIDS

Restricting the introduction of liquids into a landfill reduces the unit's potential to generate leachate (56 FR 51055; October 9, 1991). According to §258.28, only household waste (excluding septic waste), properly recirculated leachate, or gas condensate derived from the MSWLF may be disposed of in bulk or noncontainerized liquid form. Furthermore, the re-circulation of leachate or gas condensate in MSWLFs is limited to units equipped with composite liners and leachate collection systems (§258.28(a)(2)). EPA is researching bioreactor landfills, which re-circulate leachate to accelerate the decomposition and stabilization of the waste, in order to identify and prioritize future regulatory needs. Containers holding liquids may be disposed of in a MSWLF only if the waste is a household waste, the container is similar in size to one typically found in household waste, or the container is designed to hold liquids for use other than storage (e.g., beverage containers) (§258.28(b)).

RECORDKEEPING REQUIREMENTS

MSWLF owners and operators must retain certain records and documents near the facility in an operating record. In unapproved states, the following materials must be kept in the operating record (§258.29(a)):

- location restriction demonstrations required under Subpart B
- inspection records, training procedures, and notification procedures required by §258.20
- gas monitoring results and any remediation plans required by §258.23
- MSWLF unit design documentation for placement of leachate or gas condensate in a unit as required by §258.28(a)(2)
- demonstrations, certifications, findings, monitoring, testing, or analytical data required by Subpart E groundwater monitoring and corrective action
- closure and post-closure care plans and any monitoring, testing, or analytical data as required by §§258.60 and 258.61
- cost estimates and financial assurance documentation required by Part 258, Subpart G
- information demonstrating compliance with the small landfill exemption required by §258.1(f)(2).

The Director of an approved state may allow an alternative location for these records and establish alternative schedules for complying with most of the recordkeeping and notification requirements.

2.4 SUBPART D: DESIGN CRITERIA

To prevent unit failures, the regulations establish a uniform design standard for new units and lateral expansions, allowing for site-specific MSWLF designs in approved states (56 FR 50978, 51059; October 9, 1991). In states without approved permitting programs, the MSWLF design criteria require construction with a composite liner and leachate collection system. For new units and lateral expansions in approved states, §258.40(a)(1) allows greater flexibility in design.

COMPOSITE LINER SYSTEM

The uniform design criteria require a composite liner and a leachate collection system. The composite liner system consists of an upper component, which is a flexible membrane liner (FML) that satisfies specific thickness standards. The lower component must be constructed of at least a 2-foot layer of compacted soil and must exhibit a hydraulic conductivity of no more than 1×10^{-7} cm/sec. EPA believes that the combination of an FML and a compacted soil layer ensures adequate protection by providing both a highly impermeable upper liner to maximize leachate collection and removal and a lower soil layer to serve as a back-up in the event of FML failure (56 FR 51060; October 9, 1991). The leachate collection system must be designed and constructed to maintain less than a 30-cm depth of leachate over the liner (§258.40(a)(2)).

SITE-SPECIFIC DESIGNS

Flexibility in design requirements is allowed for approved states. The performance-based standard in §258.40(a)(1) requires that a MSWLF's design be capable of controlling migration of hazardous constituents into the uppermost aquifer. This design performance standard requires that maximum contaminant levels (MCLs) not be exceeded in the uppermost aquifer at the relevant point of compliance. In general, the relevant point of compliance must be located within 150 meters of the waste management boundary on the landfill owner's property.

The Director of an approved state determines whether a proposed design meets the performance standard. When reviewing a design plan, the Director of an approved state must evaluate hydrogeologic characteristics, climatic factors, and volume, physical, and chemical characteristics of the landfill's leachate (§258.40(c)).

On March 22, 2004 (69 FR 13242), EPA issued a Final Rule for Research, Development, and Demonstration Permits for Municipal Solid Waste Landfills to allow approved states to issue RD&D permits for new and existing MSWLFs in order to provide variances from certain Part 258 criteria and for new and innovative technologies associated with landfilling of municipal solid waste.

2.5 SUBPART E: GROUNDWATER MONITORING AND CORRECTIVE ACTION

Similar to the regulations for hazardous waste treatment, storage, and disposal facilities (TSDFs) in Subpart F of Part 264, MSWLF groundwater monitoring and corrective action requirements consist of three sequential phases. Detection monitoring, minimally required for all units, is designed to measure concentrations of certain indicator parameters. Statistically significant increases (SSI) in these indicators trigger groundwater assessment monitoring for hazardous constituents. Finally, a corrective action program is required if remediation of contaminated groundwater is necessary.

APPLICABILITY, WAIVERS, AND EXEMPTIONS

The groundwater monitoring and corrective action requirements in Part 258, Subpart E, apply to all MSWLFs, except in two instances. First, as a result of the LDFPA, MSWLF units meeting the small landfill exemption in §258.1(f) are exempt from the groundwater monitoring requirements in Subpart E. Second, the Director of an approved state may waive the groundwater monitoring requirements if the owner and operator can demonstrate that there is no potential for migration of hazardous constituents into the uppermost aquifer during the unit's active life and the post-closure care period (§258.50(b)). A qualified groundwater scientist, as defined in §258.50(g), must certify the demonstration.

SCHEDULE OF COMPLIANCE

Once established, groundwater monitoring must be conducted throughout the active life and post-closure care period of the MSWLF unit. While new units must be in compliance with the groundwater monitoring requirements prior to accepting waste, the compliance date in unapproved states for each existing landfill depends on its distance from a drinking water intake, as shown in Figure 2.

Figure 2

GROUNDWATER MONITORING COMPLIANCE DEADLINES FOR UNAPPROVED STATES

Proximity of an Existing MSWLF to a Drinking Water Intake	Groundwater Monitoring Compliance Date
Less than one mile	October 9, 1994 (§258.50(c)(1))
More than one mile, but less than two miles	October 9, 1995 (§258.50(c)(2))
More than two miles	October 9, 1996 (§258.50(c)(3))

In states with approved programs, the Director may establish an alternative groundwater monitoring schedule of compliance for existing MSWLF units and lateral expansions (258.50(d)). In developing this compliance schedule, the Director of an approved state should consider certain risk factors: the proximity of receptors; the size, age, and design of the unit; types and quantities of wastes disposed; and the resource value of the underlying aquifer.

The resulting schedule must ensure that, excluding units not subject to the groundwater monitoring requirements, at least 50 percent of the existing MSWLF units in the state are in compliance by October 9, 1994, and that all such existing units in the state are in compliance by October 9, 1996. The Director of an approved state may also establish alternative schedules for Subpart E notification, sampling, assessment, and recordkeeping requirements (§258.50(h)).

GENERAL GROUNDWATER MONITORING SYSTEM REQUIREMENTS

A groundwater monitoring system must be installed to yield samples from the uppermost aquifer that represent both the quality of background groundwater (usually from an upgradient well) and the extent of groundwater contamination at the waste management unit boundary (from downgradient wells). Each time groundwater is sampled, the owner and operator must determine the rate and direction of groundwater flow and measure the water elevation in each well.

The number, spacing, and depths of monitoring wells depend on site-specific characteristics such as aquifer thickness and groundwater flow rate and direction. Unless approved by the Director of an approved state, these system specifications must be certified by a qualified groundwater scientist (§258.51(d)(2)). In addition, all monitoring well bore holes and other measurement, sampling, and analytical devices must be operated to meet design specifications for the duration of the groundwater monitoring program (§258.51(c)).

The Agency recognizes that local conditions can make installation of a monitoring well system around each landfill unit difficult. In approved states, multiple MSWLF units may share a common groundwater monitoring system, provided that sharing the multiple unit system is as protective of human health and the environment as installing a separate monitoring system for each unit (§258.51(b)).

GROUNDWATER SAMPLING AND ANALYSIS PROGRAM

Consistent sampling and analytical procedures are essential to obtain reliable monitoring results that accurately measure hazardous constituents and other parameters established in either detection monitoring or assessment monitoring programs. Each MSWLF's groundwater monitoring program must be developed to ensure that monitoring results provide an accurate representation of groundwater quality at both background and downgradient wells. For example, sampling and analysis programs must include procedures and techniques for sample collection, sample preservation and shipment, analytical procedures, chain of custody control, and quality assurance and quality control (QA/QC) procedures (§258.53(a)).

In evaluating groundwater quality monitoring data, the owner and operator must use one of the statistical methods in §258.53(g). The selected method, which will be used to identify statistically significant evidence of groundwater contamination at a monitoring well, must be appropriate for the type and distribution of chemical constituents detected, or suspected to be present, in the groundwater (§258.53(h)(1)). The frequency and number of groundwater samples necessary to establish groundwater quality vary with the statistical method (56 FR 51072; October 9, 1991).

DETECTION MONITORING PROGRAM

A detection monitoring program includes monitoring for 62 constituents listed in Appendix I of Part 258 (§258.54(a)). The Director of an approved state may delete any of these monitoring constituents or establish a list of alternative inorganic indicator parameters in lieu of some or all of the heavy metals constituents, on a site-specific basis (§258.54(a)(1)).

The owner and operator must monitor for all Appendix I constituents (or alternative parameters) at least semiannually throughout the facility's active life and post-closure period (§258.54(b)). The Director of an approved state may allow an alternate frequency, but nothing less than annually. Detection of any Appendix I constituent at levels significantly higher than background concentrations requires the owner and operator to notify the State Director of the statistically significant increase (SSI) (§258.54(c)). Within 90 days after detecting an SSI, the owner and operator must establish an assessment monitoring program in accordance with §258.55.

Demonstrating that the evidence of contamination resulted from an error (e.g., an error in sampling, analysis, or statistical evaluation, or a natural variation in groundwater quality), or that a source other than the MSWLF unit caused the contamination, nullifies the assessment monitoring requirement. This demonstration allows the owner and operator to continue the detection monitoring program (§258.54(c)(3)). A qualified groundwater scientist must certify or the Director of an approved state must approve a report documenting this demonstration. Failure to make such a demonstration within 90 days triggers the assessment monitoring requirement.

ASSESSMENT MONITORING PROGRAM

An assessment monitoring program is implemented when an SSI of hazardous constituent concentrations over background levels is confirmed. Within 90 days of beginning an assessment monitoring program, and annually thereafter, the owner and operator must sample and analyze the groundwater for all Part 258, Appendix II, constituents. If any Appendix II constituent is detected in a downgradient well, background levels for that constituent must be established through analysis of at least four independent samples from each well.

The Director of an approved state is authorized to delete any of the Appendix II constituents from the assessment monitoring program or to specify an appropriate subset of wells to be sampled and analyzed (§258.55(b)). In addition, the Director may implement an alternative sampling and analysis frequency for Appendix II constituents based on factors identified in §258.55(c).

Within 90 days of establishing Appendix II background levels and on at least a semiannual basis thereafter, the owner and operator must resample for all Appendix I constituents and those Appendix II constituents detected during the initial phase of assessment monitoring (§258.55(d)(2)). Again, the Director of an approved state may specify an alternative monitoring frequency based on consideration of the site factors delineated in §258.55(c).

Groundwater Protection Standard

The MSWLF owner and operator must establish a groundwater protection standard (GWPS) for each Appendix II constituent detected in the groundwater (§258.55(h)). The GWPS represents the maximum constituent concentration level permissible in groundwater. This standard must be based either on the Safe Drinking Water Act (SDWA) MCL for the constituent or, if no MCL has been established, on the background concentration level at the site. In cases where the background level is higher than the promulgated MCL for a constituent, the GWPS should be set at the background level.

In accordance with §258.55(i), the Director of an approved state may establish an alternative GWPS for constituents that have no established MCLs. When establishing an alternative standard, the Director may consider multiple contaminants in the groundwater, such as exposure threats to sensitive environmental receptors and other site-specific factors (e.g., the reliability of exposure data and the weight of scientific evidence). Any alternative GWPS must satisfy the health-based criteria set forth in §258.55(i)(1) through (4).

Monitoring Results Determination

The owner and operator may return to detection monitoring only after concentrations of all Appendix II constituents are shown to be at or below background values for two consecutive sampling events (§258.55(e)). If the concentration of any Appendix II constituent is detected at statistically significant levels above the established GWPS, however, the owner and operator must notify the Director and all appropriate government officials (§258.55(g)). The owner and operator must then characterize the nature of the release and ascertain whether contaminants have migrated past the facility boundary, installing additional monitoring wells as necessary. If well sampling indicates that contaminants have migrated offsite, all persons who own or reside on land that directly overlies any part of the plume of contamination must be notified (§258.55(g)(1)(iii)).

If the owner and operator are able to make a successful demonstration that a source other than the MSWLF caused the contamination, or that the SSI resulted from an error, then the owner and operator may continue assessment monitoring and return to detection monitoring when all Appendix II constituents are at or below background levels (§258.55(g)(2)). Unless the demonstration is made within 90 days, the owner and operator must initiate an assessment of corrective measures (§258.55(g)(1)(iv)).

ASSESSMENT OF CORRECTIVE MEASURES

After exceeding any GWPS, within 90 days the owner and operator must initiate an assessment of various corrective measures, a process that must be completed within a reasonable period of time (§258.56(a)). Based on this assessment, the owner and operator must then select a remedy. Sections 258.56 and 258.57 set forth the criteria for determining what types of potential remedies to consider and criteria for evaluating each remedy.

When evaluating a potential remedy, the MSWLF owner and operator must assess its long- and short-term effectiveness and protectiveness, its ability to control the source and minimize further releases, the ease or difficulty of implementation in light of practical considerations (including technical and economic factors), and the degree to which it addresses community concerns. Prior to final selection of a remedy, the unit owner and operator must discuss the results of the assessment of potential remedies in a public meeting with interested and affected parties (§258.56(d)).

Per §258.57(e), the Director of an approved state may determine that remediation of a release of an Appendix II constituent is not necessary based on one of the following demonstrations:

- the groundwater is contaminated by multiple sources and cleanup of the MSWLF release would provide no significant reduction of risk
- the contaminated groundwater is not a current or potential source of drinking water and is not hydraulically connected with waters to which hazardous constituents are migrating or are likely to migrate in a concentration that would exceed the GWPS
- the remediation is not technically feasible or would result in unacceptable cross-media impacts.

IMPLEMENTATION OF THE CORRECTIVE ACTION PROGRAM

After the remedy is selected, the MSWLF owner and operator are required to implement the corrective measure, establish a corrective action groundwater monitoring program, and take any necessary interim measures (56 FR 51011; October 9, 1991). First, a schedule for initiating and completing all activities associated with implementing the selected remedy must be established. In accordance with this schedule, the owner and operator must develop and implement the corrective action groundwater monitoring program to indicate the effectiveness of the selected remedy, to meet the minimum requirements of the assessment monitoring program, and to comply with established GWPSs (§258.58(a)(1)).

During implementation of the corrective action remedy, the owner and operator are responsible for taking any interim measures consistent with the objectives and performance of the remedy that may be necessary to ensure protection of human health and the environment (§258.58(a)(3)). Similarly, the owner and operator must implement alternative methods or techniques necessary to achieve compliance with the minimum standards for any selected remedy set forth in §258.57(b).

Completion of Corrective Action

Once implemented, remedial activities at the unit must continue until the MSWLF owner and operator achieve compliance with the established GWPSs for three consecutive years, and demonstrate that all required actions have been completed (§258.58(e)). The Director of an approved state may however, specify an alternative period of time for demonstrating compliance with any GWPS (§258.58(e)(2)). Upon completion of corrective action, the owner and operator must obtain certification that the remedy is complete and notify the State Director.

2.6 SUBPART F: CLOSURE AND POST-CLOSURE CARE

MSWLFs not adequately closed and maintained after closure may pose a continuing threat to human health and the environment. As with hazardous waste facilities, EPA established requirements for MSWLF closure and post-closure care to address wastes left in place at a facility may pose a threat even after disposal activities have ceased.

CLOSURE CRITERIA

Closure standards require owners and operators to install a final landfill cover system that is designed to minimize soil erosion and infiltration of liquids through the cover. The cover's infiltration layer, consisting of at least 18 inches of earthen material, must be at least as impermeable as any bottom liner system or natural subsoils, but in no case may the permeability be greater than 1×10^{-5} cm/sec. While this standard does not explicitly require the use of a synthetic membrane in the final cover, the Agency anticipates that if a MSWLF has a synthetic membrane in the bottom of the unit, then the infiltration layer in the final cover will, in all likelihood given today's technologies, include a synthetic membrane in the final cover. The erosion layer must be a minimum of six inches of earthen material that can sustain native plant growth. The Director of an approved state may allow an alternative final cover design if the cover layers provide equivalent reduction of infiltration and protection from wind and water erosion.

Section 258.60(a) was revised on July 29, 1997, to provide additional flexibility to approved states, allowing the Director of an approved state, after public review and comment, to establish alternative infiltration barriers in the final cover for any small MSWLF (62 FR 40708). This provision is contingent on the Director accounting for climatic and hydrogeologic conditions and a determination that the alternative requirements are protective of human health and the environment.

CLOSURE PLAN

The owner and operator must prepare a written closure plan describing the measures necessary to close each MSWLF unit at a facility at any point during the unit's active life (§258.60(c)). The closure plan must include at least the following:

- a description of the final cover, and the methods and procedures used to install the cover
- an estimate of the largest area of the MSWLF that may ever require a final cover during the unit's active life
- an estimate of the maximum inventory of wastes maintained on site during the active life of the landfill facility
- a schedule for completing all activities necessary to satisfy the closure criteria specified in §258.60.

ONSET AND COMPLETION OF CLOSURE ACTIVITIES

Subpart F specifies a closure timetable for MSWLFs. In general, no later than 30 days after a MSWLF unit receives the final volume of waste, the owner and operator must begin closure activities (§258.60(f)). A unit with remaining capacity may receive additional wastes and is allowed one year following the most recent receipt of wastes to initiate closure activities. After closure begins, all closure activities must be completed within 180 days (§258.60(g)). Finally, the owner and operator must obtain either an independent registered professional engineer's certification or a Director of an approved state's approval verifying that closure has been completed in accordance with the established closure plan (§258.60(h)). In approved states, deadlines for closure activities may be extended.

POST-CLOSURE CARE REQUIREMENTS

Post-closure care entails a 30-year period after closure during which the owner and operator must conduct monitoring and maintenance activities to preserve the integrity of a MSWLF system. The purpose of post-closure care is to ensure that landfills are closed in a manner that controls, minimizes, or eliminates the escape of waste, leachate, contaminated rainfall, or waste decomposition products to soils, waters, and the atmosphere. Post-closure care requires maintaining the following:

- the integrity and effectiveness of all final covers
- the leachate collection system, in accordance with §258.40
- the applicable groundwater monitoring system, in accordance with Subpart E requirements
- the methane gas monitoring system required by §258.23.

In an approved state, the Director can modify the length of post-closure care as necessary to protect human health and the environment (§258.61(b)).

In addition to the closure plan, the owner and operator must prepare a written post-closure plan that provides a description of monitoring and maintenance activities, information identifying the facility contact for the post-closure period, and a description of the planned uses of the property during the post-closure period. Pursuant to §258.61(c)(3), any planned uses must not disturb either the integrity of the final covers and liners or the function or components of the monitoring and containment systems.

Following completion of the post-closure care period for each MSWLF unit, the owner and operator must obtain either certification of post-closure by an independent registered professional engineer or verification of completion of post-closure care activities by the Director of an approved state. The certification or approval must indicate that post-closure care has been completed in accordance with the post-closure plan (§258.61(e)).

2.7 SUBPART G: FINANCIAL ASSURANCE CRITERIA

The Part 258, Subpart G, financial assurance criteria require demonstration of responsibility for the costs of closure, post-closure care, and known corrective action. EPA believes that compliance with these requirements will help ensure responsible planning for future costs. Adequate funds must be available to hire a third party to carry out all necessary closure, post-closure care, and known corrective action activities in the event that the owner and operator declare bankruptcy or lack the technical expertise to complete the required activities (56 FR 51110; October 9, 1991).

APPLICABILITY AND EFFECTIVE DATE

Except for state and federal government entities, owners and operators of all new and existing units and lateral expansions must be in compliance with the MSWLF financial assurance requirements by April 9, 1997 (§258.70(b)). Local governments and Indian tribes are subject to the Subpart G criteria. Small landfills that qualify for the small landfill exemption under §258.1(f) must be in compliance with financial assurance requirements by October 9, 1997.

COST ESTIMATES

The amount of financial assurance, using acceptable financial mechanisms, must equal the cost of a third party conducting these activities. To determine these costs each MSWLF owner and operator must prepare a written, site-specific estimate of the costs of conducting closure, post-closure care, and known corrective action.

Closure

The owner and operator must calculate a detailed cost estimate for closure based on the largest area of a MSWLF unit that may ever require a final cover during its active life. The cost estimate must equal the expense of closing the area when the extent and manner of operation would make closure most expensive (§258.71(a)(1)).

As stated in §258.71(a)(3), the owner and operator must increase both the closure cost estimate and the amount of financial assurance maintained if the closure plan is adjusted or if changing unit conditions (e.g., increases in design capacity) raises the maximum cost of closure. The closure cost estimate and the amount of financial assurance maintained may also be reduced if, as a result of changes in facility conditions (e.g., partial closure of a landfill), the existing cost estimate exceeds the maximum cost of closure during the remaining life of the MSWLF unit. The owner and operator must document evidence supporting such a reduction.

Post-Closure Care

The financial assurance requirements for post-closure are similar to the requirements for closure of MSWLF units. The owner and operator must have a detailed, site-specific written estimate of the cost of hiring a third party to conduct post-closure care for the MSWLF unit (§258.72). This cost estimate must account for the total costs of conducting post-closure care, including annual and periodic costs described in the post-closure plan. Post-closure care cost estimates must be based on the most expensive costs during the post-closure care period (§258.72(a)(1)). As with closure cost estimates, changes in facility conditions or the post-closure plan may require the owner and operator to modify the post-closure care cost estimate and the amount of financial assurance.

Corrective Action

In accordance with §258.73, the owner and operator of a MSWLF unit required to undertake corrective action per §258.58 must have a detailed, site-specific written estimate of the cost of hiring a third party to perform corrective action for known releases. The corrective action cost estimate must account for the total expense of activities described in the corrective action plan. Again, the corrective action cost estimate and amount of financial assurance must increase or decrease in response to changes in either the corrective action program or MSWLF unit conditions.

Adjustments for Inflation

Due to changes in inflation and interest rates, cost estimates must be annually adjusted for inflation (§§258.71(a)(2), 258.72(a)(2), and 258.73(a)(1)). Updated cost estimates must account for added inflationary costs to ensure that adequate funds will be available if needed (56 FR 51111; October 9, 1991). The Subtitle C financial assurance provisions offer guidance on adjusting cost estimates using an inflation factor based on the implicit price deflator. Review the module entitled Financial Assurance for explanations of the terms and concepts in this section.

ALLOWABLE MECHANISMS

The mechanisms used to demonstrate financial assurance must ensure that the funds necessary to meet the costs of closure, post-closure care, and known corrective action will be available when needed. Owners and operators may use any of the following financial mechanisms:

- trust fund (§258.74(a))
- surety bonds guaranteeing payment or performance (§258.74(b))
- letter of credit (§258.74(c))
- insurance (§258.74(d))
- corporate financial test (§258.74(e))
- local government financial test (§258.74(f))
- corporate guarantee (§258.74(g))
- local government guarantee (§258.74(h))
- state-approved mechanism (§258.74(i))
- state assumption of financial responsibility (§258.74(j)).

In addition, the Agency expects to add financial tests and guarantees as allowable mechanisms for corporations to demonstrate financial assurance.

The performance standard in §258.74(l) requires that approved financial assurance mechanisms satisfy the following criteria:

- The amount of funds assured is sufficient to cover the costs of closure, post-closure care, and corrective action for known releases when needed.

- The funds will be available in a timely fashion when needed.

- The mechanisms for closure and post-closure care must be established by the owner and operator by the effective date of these requirements or prior to the initial receipt of solid waste, whichever is later. The mechanisms for corrective action must be secured no later than 120 days after the corrective action remedy has been selected pursuant to §258.58, and maintained until the owner and operator are released from financial assurance responsibilities.

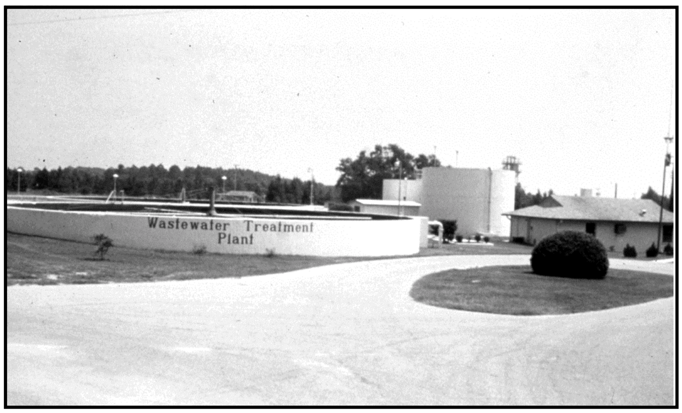
- The mechanisms must be legally valid, binding, and enforceable under state and federal law.

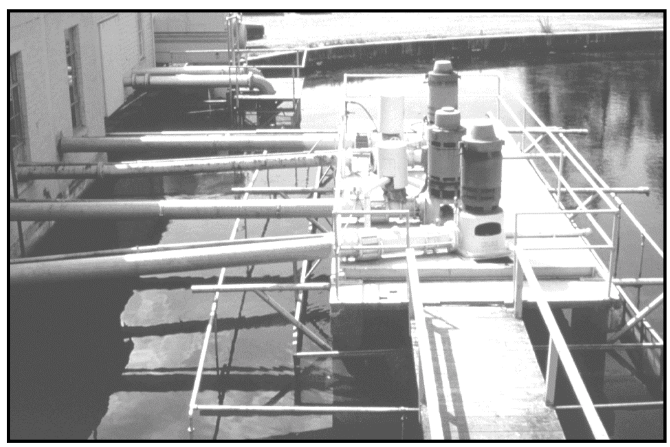
In approved states, the owner and operator may satisfy the Subpart G requirements using a state-approved mechanism. Such an alternative financial mechanism must meet the criteria specified in the performance standard and be approved by the Director of an approved state (§258.74(i)). Furthermore, the owner and operator will remain in compliance with the financial assurance requirements if the Director either assumes legal responsibility for the Subpart G requirements or ensures that funds will be available from state sources to cover these requirements (§258.74(j)). Any such state assumption of financial responsibility must satisfy the performance standard.

Finally, as with Subtitle C financial assurance, nothing precludes the MSWLF owner and operator from combining multiple financial mechanisms to satisfy the Subpart G requirements (§258.74(k)). The mechanisms must comply with all applicable requirements specified in §258.74(a) through (j), except that the combination of mechanisms, rather than any individual mechanism, must provide financial assurance for an amount at least equal to the current cost estimate for closure, post-closure care, or corrective action.

United States Environmental Protection Agency
Enforcement and Compliance Assurance (2221-A)
EPA 300-B-00-016
December 2000

Protocol for Conducting Environmental Compliance Audits for Municipal Facilities under U.S. EPA's Wastewater Regulations





EPA Office of Compliance

Notice

The statements in this document are intended solely as guidance to aid regulated entities in complying with the regulations. The guidance is not a substitute for reading the regulations and understanding all the requirements as it applies to your facility. This guidance does not constitute rulemaking by the U.S. EPA and may not be relied on to create a substantive or procedural right or benefit enforceable, at law or in equity, by any person. U.S. EPA may decide to update this guide without public notice to reflect changes in U.S. EPA's approach to implementing the regulations or to clarify and update text. To determine whether U.S. EPA has revised this document and/or to obtain copies, contact U.S. EPA's Center for Environmental Publications at 1(800) 490-9198. Additional information regarding U.S. EPA Hotlines and further assistance pertaining to the specific rules discussed in this document can be found at the end of the *Key Compliance Requirements* located in Section II. **The contents of this document reflect regulations issued as of November 6, 2000.**

Acknowledgments

U.S. EPA would like to gratefully acknowledge the support of the U.S. Army Corps of Engineers Construction Engineering Research Laboratory (CERL) for providing suggestions for overall format of this document. The Office of Compliance at U.S. EPA gratefully acknowledges the contribution of U.S. EPA's program offices and the U.S. EPA's Office of Counsel in reviewing and providing comment on this document.

This document is intended solely for guidance. No statutory or regulatory requirements are in any way altered by any statement(s) contained herein.

Table of Contents

Section I
Introduction

Background

The Environmental Protection Agency (U.S. EPA) is responsible for ensuring that businesses and organizations comply with federal laws that protect the public health and the environment. U.S. EPA's Office of Enforcement and Compliance Assurance (OECA) has begun combining traditional enforcement activities with more innovative compliance approaches including the provision of compliance assistance to the general public. U.S. EPA's Office of Compliance Assistance was established in 1994 to focus on compliance assistance-related activities. U.S. EPA is also encouraging the development of self-assessment programs at individual facilities. Voluntary audit programs play an important role in helping companies meet their obligation to comply with environmental requirements. Such assessments can be a critical link, not only to improved compliance, but also to improvements in other aspects of an organization's performance. For example, environmental audits may identify pollution prevention opportunities that can substantially reduce an organization's operating costs. Environmental audits can also serve as an important diagnostic tool in evaluating a facility's overall environmental management system or EMS.

U.S. EPA is developing 13 multi-media Environmental Audit Protocols to assist and encourage businesses and organizations to perform environmental audits and disclose violations in accordance with OECA's Audit and Small Business Policies. The audit protocols are also intended to promote consistency among regulated entities when conducting environmental audits and to ensure that audits are conducted in a thorough and comprehensive manner. The protocols provide detailed regulatory checklists that can be customized to meet specific needs under the following primary environmental management areas:

- Generation of RCRA Hazardous Waste
- Treatment Storage and Disposal of RCRA Hazardous Waste
- EPCRA
- CERCLA
- Clean Air Act
- Clean Water Act
- Safe Drinking Water Act
- TSCA
- Universal Waste and Used Oil
- Managing Nonhazardous Solid Waste
- Pesticides Management (FIFRA)
- Management of Toxic Substances (e.g., PCBs, lead-based paint, and asbestos)
- RCRA Regulated Storage Tanks

Who Should Use These Protocols?

U.S. EPA has developed these audit protocols to provide regulated entities with specific guidance in periodically evaluating their compliance with federal environmental requirements. The specific application of this particular protocol, in terms of which media or functional area it applies to, is described in Section II under "Applicability".

The Audit Protocols are designed for use by individuals who are already familiar with the federal regulations but require an updated comprehensive regulatory checklist to conduct environmental ***compliance*** audits at regulated facilities. Typically, compliance audits are performed by persons who are not necessarily media or legal experts but instead possess a working knowledge of the regulations and a familiarity with the operations and practices of the facility to be audited. These two basic skills are a prerequisite for adequately identifying areas at the facility subject to environmental regulations and potential regulatory violations that subtract from the organizations environmental performance. With these basic skills, audits can be successfully conducted by persons with various educational backgrounds (e.g., engineers, scientists, lawyers, business owners or operators). These protocols are not intended to be a substitute for the regulations nor are they intended to be instructional to an audience seeking a primer on the requirements under Title 40; however, they are designed to be sufficiently detailed to support the auditor's efforts.

The term "Protocol" has evolved over the years as a term of art among the professional practices of auditing and refers to the actual working document used by auditors to evaluate facility conditions against a given set of criteria (in this case the federal regulations). Therefore these documents describe "what" to audit a facility for rather than "how" to conduct an audit. To optimize the effective use of these documents, you should become familiar with basic environmental auditing practices. For more guidance on how to conduct environmental audits, U.S. EPA refers interested parties to two well known organizations: The Environmental Auditing Roundtable (EAR) and the Institute for Environmental Auditing (IEA).

Environmental Health and Safety Auditing Roundtable
35888 Mildred Avenue
North Ridgeville, Ohio 44039
(216) 327-6605

The Institute for Environmental Auditing
Box 23686
L'Enfant Plaza Station
Washington, DC 20026-3686

U.S. EPA's Public Policies that Support Environmental Auditing

In 1986, in an effort to encourage the use of environmental auditing, U.S. EPA published its "Environmental Auditing Policy Statement" (see 51 FR 25004). The 1986 audit policy states that "it is U.S. EPA policy to encourage the use of environmental auditing by regulated industries to help achieve and maintain compliance with environmental laws and regulation, as well as to help identify and correct unregulated environmental hazards." In addition, U.S. EPA defined environmental auditing as "a systematic, documented, periodic, and objective review of facility operations and practices related to meeting environmental requirements." The policy also identified several objectives for environmental audits:

- verifying compliance with environmental requirements,
- evaluating the effectiveness of in-place environmental management systems, and
- assessing risks from regulated and unregulated materials and practices.

In 1986, in an effort to encourage the use of environmental auditing, EPA published its "Environmental Auditing Policy Statement" (see 51 FR 25004). The 1986 audit policy states that "it is EPA policy to encourage the use of environmental auditing by regulated industries to help achieve and maintain compliance with environmental laws and regulation, as well as to help identify and correct unregulated environmental hazards." In addition, EPA defined environmental auditing as "a systematic, documented, periodic, and objective review of facility operations and practices related to meeting environmental requirements." The policy also identified several objectives for environmental audits:

- verifying compliance with environmental requirements,
- evaluating the effectiveness of in-place environmental management systems, and
- assessing risks from regulated and unregulated materials and practices.

In 1995, EPA published "Incentives for Self-Policing: Discovery, Disclosure, Correction and Prevention of Violations" – commonly known as the EPA Audit Policy – which both reaffirmed and expanded the Agency's 1986 audit policy (see 60 FR 66706 December 22, 1995). The 1995 audit policy offered major incentives for entities to discover, disclose and correct environmental violations. On April 11, 2000, EPA issued a revised final Audit Policy that replaces the 1995 Audit Policy (65 FR 19,617). The April 11, 2000 revision maintains the basic structure and terms of the 1995 Audit Policy while lengthening the prompt disclosure period to 21 days, clarifying some of its language (including the applicability of the Policy in the acquisitions context), and conforming its provisions to actual EPA practices. The revised audit policy continues the Agency's general practice of waiving or substantially mitigating gravity-based civil penalties for violations discovered through an environmental audit or through a compliance management system, provided the violations are promptly disclosed and corrected and that all of the Policy conditions are met. On the criminal side, the revised policy continues the Agency's general practice of not recommending that criminal charges be brought against entities that disclose violations that are potentially criminal in nature, provided the entity meets all of the policy's conditions. The policy safeguards human health and the environment by precluding relief for violations that cause serious environmental harm or may have presented an imminent and substantial endangerment. The audit policy is available on the Internet at www.epa.gov/auditpol.html.

In 1996, EPA issued its "Policy on Compliance Incentives for Small Businesses" which is commonly called the "Small Business Policy" (see 61 FR 27984 June 3, 1996). The Small Business Policy was intended to promote environmental compliance among small businesses by providing them with special incentives to participate in government sponsored on-site compliance assistance programs or conduct environmental audits. EPA will eliminate or reduce penalties for small businesses that voluntarily discover, promptly disclose, and correct violations in a timely manner.

On April 11, 2000, EPA issued its revised final Small Business Policy (see 65 FR 19630) to expand the options allowed under the 1996 policy for discovering violations and to establish a time period for disclosure. The major changes contained in the April 11, 2000 Small Business Policy revision include lengthening the prompt disclosure period from 10 to 21 calendar days and broadening the applicability of the Policy to violations uncovered by small businesses through any means of voluntary discovery. This broadening of the Policy takes advantage of the wide range of training, checklists, mentoring, and other activities now available to small businesses through regulatory agencies, private organizations, and the Internet.

More information on EPA's Small Business and Audit/Self-Disclosure Policies are available by contacting EPA's Enforcement and Compliance Docket and Information Center at (202) 564-2614 or visiting the EPA web site at: http://www.epa.gov/oeca/ccsmd/profile.html.

How to Use The Protocols

Each protocol provides guidance on key requirements, defines regulatory terms, and gives an overview of the federal laws affecting a particular environmental management area. They also include a checklist containing detailed procedures for conducting a review of facility conditions. The audit protocols are designed to support a wide range of environmental auditing needs; therefore several of the protocols in this set or sections of an individual protocol may not be applicable to a particular facility. To provide greater flexibility, each audit protocol can be obtained electronically from the U.S. EPA Website (www.epa.gov/oeca/ccsmd/profile.html). The U.S. EPA Website offers the protocols in a word processing format which allows the user to custom-tailor the checklists to more specific environmental aspects associated with the facility to be audited.

The protocols are not intended to be an exhaustive set of procedures; rather they are meant to inform the auditor, about the degree and quality of evaluation essential to a thorough environmental audit. U.S. EPA is aware that other audit approaches may also provide an effective means of identifying and assessing facility environmental status and in developing corrective actions.

It is important to understand that there can be significant overlap within the realm of the federal regulations. For example, the Department of Transportation (DOT) has established regulations governing the transportation of hazardous materials. Similarly, the Occupational Safety and Health Administration (OSHA) under the U.S. Department of Labor has promulgated regulations governing the protection of workers who are exposed to hazardous chemicals. There can also be significant overlap between federal and state environmental regulations. In fact, state programs that implement federally mandated programs may contain more stringent requirements that are not included in these protocols. There can also be multiple state agencies regulating the areas covered in these protocols. The auditor also should determine which regulatory agency has authority for implementing an environmental program so that the proper set of regulations is consulted. Prior to conducting the audit, the auditor should review federal, state and local environmental requirements and expand the protocol, as required, to include other applicable requirements not included in these documents.

<u>Review of Federal Legislation and Key Compliance Requirements</u>:

These sections are intended to provide only supplementary information or a "thumbnail sketch" of the regulations and statutes. These sections are not intended to function as the main tool of the protocol (this is the purpose of the checklist). Instead, they serve to remind the auditor of the general thrust of the regulation and to scope out facility requirements covered by that particular regulation. For example, a brief paragraph describing record keeping and reporting requirements and the associated subpart citations will identify and remind the auditor of a specific area of focus at the facility. This allows the auditor to plan the audit properly and to identify key areas and documents requiring review and analysis.

<u>State and Local Regulations</u>:

Each U.S. EPA Audit Protocol contains a section alerting the auditor to typical issues addressed in state and local regulations concerning a given topic area (e.g., RCRA and used oil). From a practical standpoint, U.S. EPA cannot present individual state and local requirements in the protocols. However, this section does provide general guidance to the auditor regarding the division of statutory authority between U.S. EPA and the states over a specific media. This section also describes circumstances where states and local governments may enact more stringent requirements that go beyond the federal requirements.

U.S. EPA cannot overemphasize how important it is for the auditor to take under consideration the impact of state and local regulations on facility compliance. U.S. EPA has delegated various levels of authority to a majority of the states for most of the federal regulatory programs including enforcement. For example, most facilities regulated under RCRA, and/or CWA have been issued permits written by the states to ensure compliance with federal and state regulations. In turn, many states may have delegated various levels of authority to local jurisdictions. Similarly, local governments (e.g., counties, townships) may issue permits for air emissions from the facility. Therefore, auditors are advised to review local and state regulations in addition to the federal regulations in order to perform a comprehensive audit.

<u>Key Terms and Definitions</u>:

This section of the protocol identifies terms of art used in the regulations and the checklists that are listed in the "Definitions" sections of the Code of Federal Regulations (CFR). It is important to note that not <u>all</u> definitions from the CFR may be contained in this section, however; those definitions which are commonly repeated in the checklists or are otherwise critical to an audit process are included. Wherever possible, we have attempted to list these definitions as they are written in the CFR and <u>not</u> to interpret their meaning outside of the regulations.

<u>The Checklists</u>:

The checklists delineate what should be evaluated during an audit. The left column states either a requirement mandated by regulation or a good management practice that exceeds the requirements of the federal regulations. The right column gives instructions to help conduct the evaluation. These instructions are performance objectives that should be accomplished by the auditor. Some of the performance objectives may be simple documentation checks that take only a few minutes; others may require a time-intensive physical inspection of a facility. The checklists contained in these protocols are (and must be) sufficiently detailed to identify any area of the company or organization that would potentially receive a notice of violation if compliance is not achieved. For this reason, the checklists often get to a level of detail such that a specific paragraph of the subpart (e.g., 40 CFR 262.34(a)(1)(i)) contained in the CFR is identified for verification by the auditor. The checklists contain the following components:

- **"Regulatory Requirement or Management Practice Column"**
  The "Regulatory Requirement or Management Practice Column" states either a requirement mandated by regulation or a good management practice that exceeds the requirements of the federal regulations. The regulatory citation is given in parentheses after the stated requirement. Good management practices are distinguished from regulatory requirements in the checklist by the acronym (MP) and are printed in italics.

- **"Reviewer Checks" Column:**
  The items under the "Reviewer Checks:" column identify requirements that must be verified to accomplish the auditor's performance objectives. (*The key to successful compliance auditing is to verify and document site observations and other data.)* The checklists follow very closely with the text in the CFR in order to provide the service they are intended to fulfill (i.e., *to be used for compliance auditing)*. However, they are not a direct recitation of the CFR. Instead they are organized into more of a functional arrangement (e.g., record keeping and reporting requirements vs. technical controls) to accommodate an auditor's likely sequence of review during the site visit. Wherever possible, the statements or items under the "Reviewer Checks" column, will follow the same sequence or order of the citations listed at the end of the statement in the "Regulatory Requirement" column.

- **"NOTE:" Statements**
  "Note:" statements contained in the checklists serve several purposes. They usually are distinguished from "Verify" statements to alert the auditor to *exceptions or conditions* that may affect requirements or to referenced standards that are not part of Title 40 (e.g., American Society for Testing and Materials (ASTM) standards). They also may be used to identify options that the regulatory agency may choose in interacting with the facility (e.g, permit reviews) or options the facility may employ to comply with a given requirement.

- **Checklist Numbering System**:
  The checklists also have a unique numbering system that allows the protocols to be more easily updated by topic area (e.g., RCRA Small Quantity Generator). Each topic area in turn is divided into control breaks to allow the protocol to be divided and assigned to different teams during the audit. This is why blank pages may appear in the middle of the checklists. Because of these control breaks, there is intentional repetition of text (particularly "Note" Statements) under the "Reviewer Checks" column to prevent oversight of key items by the audit team members who may be using only a portion of the checklist for their assigned area.

Updates:

Environmental regulations are continually changing both at the federal and state level. For this reason, it is important for environmental auditors to determine if any new regulations have been issued since the publication of each protocol document and, if so, amend the checklists to reflect the new regulations. Auditors may become aware of new federal regulations through periodic review of Federal Register notices as well as public information bulletins from trade associations and other compliance assistance providers. In addition, U.S. EPA offers information on new regulations, policies and compliance incentives through several Agency Websites. Each protocol provides specific information regarding U.S. EPA program office websites and hotlines that can be accessed for regulatory and policy updates.

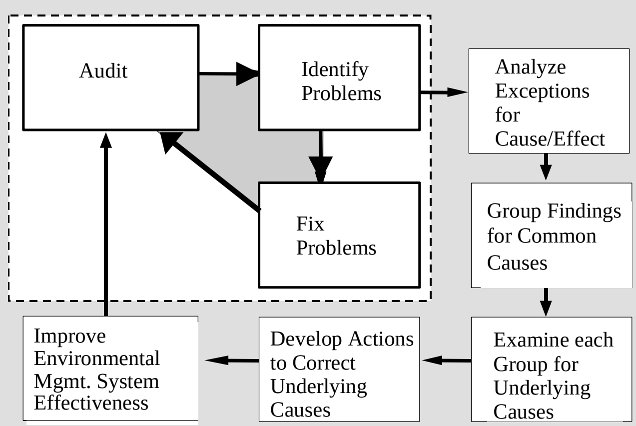
U.S. EPA will periodically update these audit protocols to ensure their accuracy and quality. Future updates of the protocols will reflect not only the changes in federal regulations but also public opinion regarding the usefulness of these documents. Accordingly, the Agency would like to obtain feedback from the public regarding the format, style and general approach used for the audit protocols. The last appendix in each protocol document contains a user satisfaction survey and comment form. This form is to be used by U.S. EPA to measure the success of this tool and future needs for regulatory checklists and auditing materials.

The Relationship of Auditing to Environmental Management Systems

An environmental auditing program is an integral part of any organization's environmental management system (EMS). Audit findings generated from the use of these protocols can be used as a basis to implement, upgrade, or benchmark environmental management systems. Regular environmental auditing can be the key element to a high quality environmental management program and will function best when an organization identifies the "root causes" of each audit finding. Root causes are the primary factors that lead to noncompliance events. For example a violation of a facility's wastewater discharge permit may be traced back to breakdowns in management oversight, information exchange, or inadequate evaluations by untrained facility personnel.

As shown in Figure 1, a typical approach to auditing involves three basic steps: conducting the audit, identifying problems (audit findings), and fixing identified deficiencies. When the audit process is expanded, to identify and correct root causes to noncompliance, the organization's corrective action part of its EMS becomes more effective. In the expanded model, audit findings (exceptions) undergo a root cause analysis to identify underlying causes to noncompliance events. Management actions are then taken to correct the underlying causes behind the audit findings and improvements are made to the organizations overall EMS before another audit is conducted on the facility. Expanding the audit process allows the organization to successfully correct problems, sustain compliance, and prevent discovery of the same findings again during subsequent audits. Furthermore, identifying the root cause of an audit finding can mean identifying not only the failures that require correction but also successful practices that promote compliance and prevent violations. In each case a root cause analysis should uncover the failures while promoting the successes so that an organization can make continual progress toward environmental excellence.

Figure 1 - Expanded Corrective Action Model



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Section II
Audit Protocols

Applicability

This protocol applies to municipal facilities that discharge wastewater directly to waters of the United States or that prepare and dispose of sewage sludge. Note: A state or federal permit sets the conditions and effluent limitations on a facility's discharge(s). The auditor will need to develop specific checklist items pertaining to the conditions and requirements in the applicable permit.

For additional wastewater related requirements, refer to the following U.S. EPA Audit Protocols:

- *Protocol for Conducting Environmental Compliance Audits under the Clean Air Act*: Volume I (This volume includes Standards of Performance for Sewage Treatment Plants, 40 CFR Part 60, Subpart O):
- *Protocol for Conducting Environmental Compliance Audits of Industrial Facilities under U.S. EPA Wastewater Regulations;* and
- *Protocol for Conducting Environmental Compliance Audits under the Storm Water Program.*

Not all checklist items contained in this document will be applicable to a particular facility. Guidance is provided on the checklist to direct the auditor to the regulations typically applicable to the types of activities identified above. In addition to the federal regulations, there are numerous environmental regulatory requirements administered by federal, state, and local governments. Each level of government may have a major impact on areas at the facility that are subject to the audit. Therefore, auditors are advised to review all federal, state and local permits and regulations in order to perform a comprehensive audit.

Federal Legislation

The Federal Water Pollution Control Act
This act, commonly known as the Clean Water Act (CWA), as amended February 4, 1987, 33 U.S. Code (USC) 1251-1387, Public Law (PL) 100-4, governs the control of water pollution in the nation. The act's primary objective is to restore and maintain the chemical, physical, and biological integrity of the nation's surface waters. The CWA regulates "priority" pollutants, including various toxic pollutants; "conventional" pollutants, such as biochemical oxygen demand, total suspended solids, fecal coliform, oil and grease, and pH; and "non-conventional" pollutants, including any pollutant not identified as either conventional or priority.

State/Local Regulations

States typically have wastewater discharge legislation and regulations that require permitting similar to permits under the CWA's National Pollutant Discharge Elimination System (NPDES) program. The U. S. Environmental Protection Agency (U.S. EPA) may authorize a state to administer the NPDES program for discharges within that state. Some States do not administer the NPDES program and will issue a state permit instead, even though U.S. EPA has issued an NPDES permit. The states and U.S. EPA normally cooperate in the permit issuance process to ensure that the two permits are consistent. However, there may be differences in monitoring requirements and the number of pollutants limited. These requirements normally do not conflict, but may require additional sampling and reporting.

States may have more stringent requirements for wastewater treatment plant operations. Many states have wastewater treatment plant (MWWTP) operator licensing and certification programs that require that and operator pass an exam and have a required amount of experience.

Local entities (cities, counties, special districts) may also have enforceable wastewater discharge limitations, known as 'local limits," that regulate discharges to a publicly owned treatment works (POTW). Local limitations often include pH, temperature, and concentration of various organic and inorganic compounds. Major industrial operations which discharge to an offsite POTW will be subject to pretreatment permits issued by the POTW, state, or by U.S. EPA as appropriate.

Key Compliance Requirements

NPDES Permits
The CWA regulates both direct and indirect discharges. The NPDES program (CWA Section 402) controls direct discharges into navigable waters. Direct discharges or "point source" discharges are from such sources as pipes and sewers. These include discharges of municipal wastewater, as well as storm water conveyed through a municipal separate storm water system. A municipality may have several different types of sources whose discharges are controlled by its NPDES permit including a wastewater treatment plant, combined sewer overflow, municipal storm water discharge, and an emerging area, sanitary sewer overflow.

NPDES permits, issued by either U.S. EPA or an authorized state (U.S. EPA has authorized 43 states and the U.S. Virgin Islands to administer the NPDES program), contain technology-based and/or water quality-based limits and establish pollutant monitoring requirements. Each municipality that intends to discharge into the nation's waters must obtain a permit prior to initiating its discharge. A permit applicant must provide quantitative analytical data identifying the types of pollutants present in the facility's effluent. The permit then sets the conditions and effluent limitations on the facility discharges.

An NPDES permit may also include discharge limits based on federal or state water quality criteria or standards that were designed to protect designated uses of surface waters, such as supporting aquatic life or recreation. These standards, unlike the technological standards, generally do not take into account technological feasibility or costs. Water quality criteria and standards vary from state to state and from site to site, depending on the use classification of the receiving water body. Most states follow U.S. EPA guidelines, which propose aquatic life and human health criteria for many of the 126 priority pollutants.

Local governments that own and operate wastewater treatment plants are required to apply for and obtain an NPDES permit. Permittees are required to manage and maintain their operations according to the parameters of the permit. This management includes: taking sample and measurements, maintaining records of results and data submitted to the permitting authority, and reporting noncompliance (40 CFR 122).

Combined Sewer Systems
U.S. EPA's 1994 *Combined Sewer Overflow (CSO) Control Policy* provides recommended NPDES permit conditions for municipalities with combined sewer systems. These provisions, which are typically implemented by the permitting authority, include requirements for meeting the nine minimum controls to reduce the frequency and water quality impacts of CSO events and to establish a long-term control plan to address capital improvements to the system. Local governments that operate and maintain a combined collection system must abide by these requirements, which are included as part of the NPDES permit.

Sanitary Sewer Overflows
Sanitary sewer overflows (SSOs) are discharges of untreated sewage from a separate sanitary sewer collection system prior to the headworks of a sewage treatment plant. These systems are designed to collect and convey sewage from households and businesses and wastewater from industries to sewage treatment plants, for treatment in accordance with CWA requirements prior to discharge to waters of the United States. SSO discharges to water of the United States are prohibited by the CWA unless authorized by a NPDES permit.

Storm Water Discharges.
In 1987, Congress amended the CWA and required U.S. EPA to establish a program to address storm water discharges. In response, U.S. EPA promulgated the NPDES storm water regulations. Implemented in two phases, the first phase requires local governments that operate large (serving a population greater than 250,000) or medium

(serving a population from 100,000 to 250,000) municipal separate storm water systems to apply for and obtain an NPDES storm water permit. During the second phase, local governments operating regulated small municipal separate storm water systems are required to submit to U.S. EPA a Notice of Intent (NOI) to be covered under a national general storm water permit. For audit checklist items pertaining to these requirements, refer to U.S. EPA's *Protocol for Conducting Environmental Compliance Audits under the Storm Water Program* (expected publication in the late 2000 or early 2001).

In addition to requiring storm water permits for collection systems, the CWA may also require local government operations to obtain or be covered by storm water permits. Such operations may include construction activities (e.g., roads, buildings) or storage of chemicals or hazardous materials.

Pretreatment Program
The CWA also regulates discharges to POTWs under the national pretreatment program (CWA Section 307(b)). The pretreatment program controls the indirect discharge of pollutants to POTWs by "industrial users," and prohibits the discharge of certain types of pollutants to a POTW. The goals are to protect municipal wastewater treatment plants from damage that may occur when hazardous, toxic, or other wastes are discharged into a sewer system and to protect the quality of sludge generated by these plants.

Although discharges to a POTW are regulated primarily by the POTW itself, rather than the state or U.S. EPA, U.S. EPA has developed technology-based standards, known as "categorical pretreatment standards," for certain industrial users of POTWs. Different standards apply to existing and new sources within each industry category. For audit checklist items pertaining to selected categorical standards for industrial users, refer to U.S. EPA's *Protocol for Conducting Environmental Compliance Audits of Industrial Facilities under U.S. EPA's Wastewater Regulations*).

Local governments that own and operate POTWs must meet the requirements for a pretreatment program under the CWA. In addition to the categorical standards mentioned above, a POTW develops another kind of pretreatment standard, "local limits," to assist the POTW in achieving the effluent limitations in its NPDES permit. The program may include requirements for industrial users to treat waste prior to its discharge to the sanitary sewer and/or to develop a slug plan. The POTW's pretreatment program must be approved by the Approval Authority (state or U.S. EPA). In association with the pretreatment program, POTWs are required to develop and implement an enforcement response plan and maintain a list of significant industrial users (40 CFR 403.12(f)).

Sewage Sludge Management
The CWA and associated regulations govern land application and land disposal of sludge generated from municipal wastewater treatment. The Section 503 regulations establish provisions for sludge quality, application rates, and environmental conditions under which land application is permitted. The regulations also specify management methods, monitoring, and recordkeeping for both disposal and land application facilities. Local governments that produce sludge from their wastewater treatment operations are subject to the Section 503 regulations.

Land Application of Sewage Sludge
Sludge that is generated during the treatment of domestic sludge in a POTW is required to be managed according to certain parameters for pathogen control and vector attraction reduction (40 CFR 503.30 through 503.33), pollutant concentrations, pollutant loading rates, ceiling concentrations, and annual pollutant loading rates for the following situations:

1. bulk sewage sludge or sewage sludge sold or given away in a bag or other container
2. the application of bulk sewage sludge to agricultural land, forest, a public contact site, or a reclamation site
3. the application of bulk sewage sludge to a lawn or home garden,
4. the application of domestic septage to agricultural land, forest, or a reclamation site, or
5. the application of sewage sludge to an active sewage sludge unit.

These regulations implement requirements for both the preparation and the application of the sewage sludge and requirements for monitoring, reporting, and recordkeeping (40 CFR 503.10 through 503.18).

Surface Disposal of Sewage Sludge
Active sewage sludge units are subject to operational requirements based on their location and design. Operational requirements include monitoring the sludge for specific pollutants, runoff management, leachate management, covering the sludge, and meeting pathogen and vector attraction reduction requirements (40 CFR 503.30 through 503.33). Records are required to be kept on how all of these requirements are met and the results of sampling for 5 yr (40 CFR 503.20 through 503.28).

Incineration of Sewage Sludge
Sewage sludge incinerators are required to meet emissions limitations for beryllium, mercury, hydrocarbons. The sludge being fed to the incinerator is required to meet specific limitation for arsenic, cadmium, chromium, and nickel. Detailed operational records are required to be kept for 5 yr. Types of information to be maintained include: the stack emissions, the constituents of the sludge being fed to the incinerator, combustion temperatures, air pollution control device operating parameters, sewage sludge feed rate, the stack height, the dispersion factor for the site, and calibration and maintenance logs (40 CFR 503.40 through 503.48).

Key Terms and Definitions

Act
The Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq., 86 Stat. 816, Pub. L. 92-500 (40 CFR 401.11 and 40 CFR 403.3).

Active Sewage Sludge Unit
A sewage sludge unit that has not closed (40 CFR 503.21).

Administrator
The Administrator of the United States Environmental Protection Agency, or an authorized representative (40 CFR 122.2 and 40 CFR 401.11).

Aerobic Digestion
The biochemical decomposition of organic matter in sewage sludge into carbon dioxide and water by microorganisms in the presence of air (40 CFR 503.31).

Agricultural Land
Land on which a food crop, a feed crop, or a fiber crop is grown. This includes range land and land used as pasture (40 CFR 503.11).

Agronomic Rate
The whole sludge application rate (dry weight basis) designed (40 CFR 503.11):
1. to provide the amount of nitrogen needed by the food crop, feed crop, fiber crop, cover crop, or vegetation grown on the land; and
2. to minimize the amount of nitrogen in the sewage sludge that passes below the root zone of the crop or vegetation grown on the land to the ground water.

Air Pollution Control Device
One or more processes used to treat the exit gas from a sewage sludge incinerator stack (40 CFR 503.41).

Anaerobic Digestion
The biochemical decomposition of organic matter in sewage sludge into methane gas and carbon dioxide by microorganisms in the absence of air (40 CFR 503.31).

Animal Feeding Operation
A lot or facility (other than an aquatic animal production facility) where the following conditions are met (40 CFR 122.23(b)(1) and 122.23(b)(2)):
1. animals (other than aquatic animals) have been, are, or will be stabled or confined and fed or maintained for a total of 45 days or more in any 12-mo period, and

2. crops, vegetation forage growth, or post-harvest residues are not sustained in the normal growing season over any portion of the lot or facility.

Two or more animal feeding operations under common ownership are considered, for the purposes of NPDES regulations, to be a single animal feeding operation if they adjoin each other or if they use a common area or system for the disposal of wastes.

Annual Pollutant Loading Rate
The maximum amount of a pollutant that can be applied to a unit area of land during a 365-day period (40 CFR 503.11).

Annual Whole Sludge Application Rate
The maximum amount of sewage sludge (dry weight basis) that can be applied to a unit area of land during a 365 day period (40 CFR 503.11).

Applicable Standards and Limitations
All state, interstate, and federal standards and limitations to which a "discharge," a "sewage sludge use or disposal practice," or a related activity is subject under the CWA, including "effluent limitations," water quality standards, standards of performance, toxic effluent standards or prohibitions, "best management practices," pretreatment standards, and "standards for sewage sludge use or disposal" under sections 301, 302, 303, 304, 306, 307, 308, 403 and 405 of CWA (40 CFR 122.2).

Application
The U.S. EPA standard national forms for applying for a permit, including any additions, revisions or modifications to the forms; or forms approved by U.S. EPA for use in "approved states," including any approved modifications or revisions (40 CFR 122.2).

Apply Sewage Sludge or Sewage Sludge Applied to the Land
Land application of sewage sludge (40 CFR 503.9(a).

Approval Authority
The Director in an NPDES state with an approved state pretreatment program and the appropriate Regional Administrator in a non-NPDES state or NPDES state without an approved state pretreatment program (40 CFR 403.3(c)).

Approved POTW Pretreatment Program or Program or POTW Pretreatment Program
A program administered by a POTW that meets the criteria established in this regulation (40 CFR 403.8 and 403.9) and which has been approved by the U.S. EPA or authorized regulatory agency in accordance with 40 CFR 403.11 of this regulation (40 CFR 403.3(d)).

Approved Program or Approved State
A state or interstate program which has been approved or authorized by U.S. EPA under 40 CFR 123 (40 CFR 122.2).

Aquaculture Project
A defined managed water area which uses discharges of pollutants into that designated area for the maintenance or production of harvestable freshwater, estuarine, or marine plants or animals (40 CFR 122.25(b)(1)).

Aquifer
A geologic formation, group of geologic formations, or a portion of a geologic formation capable of yielding ground water to wells or springs (40 CFR 503.21).

Auxiliary Fuel
Fuel used to augment the fuel value of sewage sludge. This includes, but is not limited to, natural gas, fuel oil, coal, gas generated during anaerobic digestion of sewage sludge, and municipal solid waste (not to exceed 30 percent of the dry weight of sewage sludge and auxiliary fuel together). Hazardous wastes are not auxiliary fuel (40 CFR 503.41).

Average Daily Concentration
The arithmetic mean of the concentration of a pollutant in milligrams per kilogram of sewage sludge (dry weight basis) in the samples collected and analyzed in a month (40 CFR 503.41).

Average Monthly Discharge Limitation
The highest allowable average of "daily discharges" over a calendar month, calculated as the sum of all "daily discharges" measured during a calendar month divided by the number of "daily discharges" measured during that month (40 CFR 122.2).

Average Weekly Discharge Limitation
The highest allowable average of "daily discharges" over a calendar week, calculated as the sum of all "daily discharges" measured during a calendar week divided by the number of "daily discharges" measured during that week (40 CFR 122.2).

Base Flood
A flood that has a one percent chance of occurring in any given year (i.e., a flood with a magnitude equaled once in 100 yr) (40 CFR 503.9(b)).

Best Management Practices ("BMPs")
Schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of "waters of the United States." BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage (40 CFR 122.2).

Blowdown
The minimum discharge of recirculating water for the purpose of discharging materials contained in the water, the further buildup of which would cause concentration in amounts exceeding limits established by best engineering practice (40 CFR 401.11).

Bulk Sewage Sludge
Sewage sludge that is not sold or given away in a bag or other container for application to the land (40 CFR 503.110).

Bypass - the intentional diversion of waste streams from any portion of a treatment facility (40 CFR 122.41(m)(1)(i) and 40 CFR 403.17).

Categorical Pretreatment Standard
A standard promulgated by U.S. EPA under 40 CFR Chapter I, Subchapter N (40 CFR 125.58(g)).

Class I Sludge Management Facility
Any POTW identified under 40 CFR 403.8(a) as being required to have an approved pretreatment program (including such POTWs located in a state that has elected to assume local program responsibilities pursuant to 40 CFR 403.10(e)) and any other treatment works treating domestic sewage classified as a Class I sludge management facility by the U.S. EPA or authorized regulatory agency, in the case of approved state programs, because of the potential for its sludge use or disposal practices to adversely affect public health and the environment (40 CFR 122.2).

Class I Sludge Management Facility
Any publicly owned treatment works (POTW), as defined in 40 CFR 501.2, required to have an approved pretreatment program under 40 CFR 403.8(a) (including any POTW located in a State that has elected to assume local program responsibilities pursuant to 40 CFR 403.10(e)) and any treatment works treating domestic sewage, as defined in 40 CFR 122.2, classified as a Class I sludge management facility by the U.S. EPA Regional Administrator, or, in the case of approved State programs, the Regional Administrator in conjunction with the State Director, because of the potential for its sewage sludge use or disposal practice to affect public health and the environment adversely (40 CFR 503.9(c)).

Class A Sewage Sludge
When one of the following methods is used, sludge is considered Class A with respect to pathogens (40 CFR 503.32(a)(3)):

1. Alternative 1: Either the density of fecal coliform in the sewage sludge shall be less than 1000 most probable number/gram (MPN/g) of total solids (dry weight basis), or the density of *Salmonella* sp. bacteria in the sewage sludge shall be less than 3 MPN/4 g of total solids (dry weight basis) at the time the sewage sludge is used or disposed; at the time the sewage sludge is prepared for sale or give away in a bag or other container for application to the land; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet the requirements in 40 CFR 503.10(b), 503.10(c), 503.10(e), or 503.10(f).

   The temperature of the sewage sludge that is used or disposed shall be maintained at a specific value for a period of time. When the percent solids of the sewage sludge is 7 percent or higher, the temperature of the sewage sludge shall be 50 °C or higher; the time period shall be 20 min or longer; and the temperature and time period shall be determined using the following equation, except when small particles of sewage sludge are heated by either warmed gases or an immiscible liquid.

   $$D = \frac{131{,}700{,}000}{10\ 0^{.1400t}} \quad \text{Eq (2)}$$

   Where, D = time in days and t = temperature in °C.

   When the percent solids of the sewage sludge is 7 percent or higher and small particles of sewage sludge are heated by either warmed gases or an immiscible liquid, the temperature of the sewage sludge shall be 50 °C or higher; the time period shall be 15 s or longer; and the temperature and time period shall be determined using the above equation.

   When the percent solids of the sewage sludge is less than 7 percent and the time period is at least 15 s, but less than 30 min, the temperature and time period shall be determined using the above equation.

   When the percent solids of the sewage sludge is less than 7 percent; the temperature of the sewage sludge is 50 °C or higher; and the time period is 30 min or longer, the temperature and time period shall be determined using the below equation.

   $$D = \frac{50{,}070{,}000}{10\ 0^{.1400t}} \quad \text{Eq(3)}$$

   Where, D = time in days and t = temperature in °C.

2. Alternative 2: Either the density of fecal coliform in the sewage sludge is less than 1000 MPN/g of total solids (dry weight basis), or the density of *Salmonella* sp. bacteria in the sewage sludge shall be less than 3 MPN/4 g of total solids (dry weight basis) at the time the sewage sludge is used or disposed; at the time the sewage sludge is prepared for sale or give away in a bag or other container for application to the land; or at the time the sewage

sludge or material derived from sewage sludge is prepared to meet the requirements in 40 CFR 503.10(b), 503.10(c), 503.10(e), or 503.10(f).

The pH of the sewage sludge that is used or disposed shall be raised to above 12 and shall remain above 12 for 72 h.

The temperature of the sewage sludge shall be above 52 °C for 12 h or longer during the period that the pH of the sewage sludge is above 12.

At the end of the 72 h period during which the pH of the sewage sludge is above 12, the sewage sludge shall be air dried to achieve a percent solids in the sewage sludge greater than 50 percent.

3. Alternative 3: Either the density of fecal coliform in the sewage sludge shall be less than 1000 MPN/g of total solids (dry weight basis), or the density of *Salmonella* sp. bacteria in sewage sludge shall be less than 3 MPN/4 g of total solids (dry weight basis) at the time the sewage sludge is used or disposed; at the time the sewage sludge is prepared for sale or give away in a bag or other container for application to the land; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet the requirements in 40 CFR 503.10(b), 503.10(c), 503.10(e), or 503.10(f).

   The sewage sludge shall be analyzed prior to pathogen treatment to determine whether the sewage sludge contains enteric viruses.

   When the density of enteric viruses in the sewage sludge prior to pathogen treatment is less than one plaque-forming unit per 4 g of total solids (dry weight basis), the sewage sludge is Class A with respect to enteric viruses until the next monitoring episode for the sewage sludge.

   When the density of enteric viruses in the sewage sludge prior to pathogen treatment is equal to or greater than one plaque-forming unit per 4 g of total solids (dry weight basis), the sewage sludge is Class A with respect to enteric viruses when the density of enteric viruses in the sewage sludge after pathogen treatment is less than one plaque-forming unit per 4g of total solids (dry weight basis) and when the values or ranges of values for the operating parameters for the pathogen treatment process that produces the sewage sludge that meets the enteric virus density requirement are documented.

   After the enteric virus reduction is demonstrated for the pathogen treatment process, the sewage sludge continues to be Class A with respect to enteric viruses when the values for the pathogen treatment process operating parameters are consistent with the values or ranges of values documented.

   The sewage sludge shall be analyzed prior to pathogen treatment to determine whether the sewage sludge contains viable helminth ova.

   When the density of viable helminth ova in the sewage sludge prior to pathogen treatment is less than 1 per 4 g of total solids (dry weight basis), the sewage sludge is Class A with respect to viable helminth ova until the next monitoring episode for the sewage sludge.

   When the density of viable helminth ova in the sewage sludge prior to pathogen treatment is equal to or greater than 1 per 4 g of total solids (dry weight basis), the sewage sludge is Class A with respect to viable helminth ova when the density of viable helminth ova in the sewage sludge after pathogen treatment is less than 1 per 4 g of total solids (dry weight basis) and when the values or ranges of values for the operating parameters for the pathogen treatment process that produces the sewage sludge that meets the viable helminth ova density requirement are documented.

   After the viable helminth ova reduction is demonstrated for the pathogen treatment process, the sewage sludge continues to be Class A with respect to viable helminth ova when the values for the pathogen treatment process operating parameters are consistent with the values or ranges of values documented.

4. Alternative 4: Either the density of fecal coliform in the sewage sludge shall be less than 1000 MPN/g of total solids (dry weight basis), or the density of *Salmonella* sp. bacteria in the sewage sludge shall be less than 3 MPN/4 g of total solids (dry weight basis) at the time the sewage sludge is used or disposed; at the time the sewage sludge is prepared for sale or give away in a bag or other container for application to the land; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet the requirements in 40 CFR 503.10(b), 503.10(c), 503.10(e), or 503.10(f).

   The density of enteric viruses in the sewage sludge shall be less than 1 plaque-forming unit per 4 g of total solids (dry weight basis) at the time the sewage sludge is used or disposed; at the time the sewage sludge is prepared for sale or give away in a bag or other container for application to the land; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet the requirements in 40 CFR 503.10(b), 503.10(c), 503.10(e), or 503.10(f), unless otherwise specified by the permitting authority.

   The density of viable helminth ova in the sewage sludge shall be less than 1 per 4 g of total solids (dry weight basis) at the time the sewage sludge is used or disposed; at the time the sewage sludge is prepared for sale or give away in a bag or other container for application to the land; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet the requirements in 40 CFR 503.10(b), 503.10(c), 503.10(e), or 503.10(f), unless otherwise specified by the permitting authority.

5. Alternative 5: Either the density of fecal coliform in the sewage sludge shall be less than 1000 MPN/g of total solids (dry weight basis), or the density of *Salmonella* sp. bacteria in the sewage sludge shall be less than 3 MPN/4 g of total solids (dry weight basis) at the time the sewage sludge is used or disposed; at the time the sewage sludge is prepared for sale or given away in a bag or other container for application to the land; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet the requirements in 40 CFR 503.10(b), 503.10(c), 503.10(e), or 503.10(f).

   Sewage sludge that is used or disposed shall be treated in one of the Processes to Further Reduce Pathogens described in appendix B of 40 CFR 503.

6. Alternative 6: Either the density of fecal coliform in the sewage sludge shall be less than 1000 MPN/g of total solids (dry weight basis), or the density of *Salmonella* sp. bacteria in the sewage sludge shall be less than 3 MPN/4 g of total solids (dry weight basis) at the time the sewage sludge is used or disposed; at the time the sewage sludge is prepared for sale or given away in a bag or other container for application to the land; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet the requirements in 40 CFR 503.10(b), 503.10(c), 503.10(e), or 503.10(f).

   Sewage sludge that is used or disposed shall be treated in a process that is equivalent to a Process to Further Reduce Pathogens, as determined by the permitting authority.

Class B Sewage Sludge
When one of the following methods is used, it is considered Class B with respect to pathogens (40 CFR 503.32(b)(2)):

1. Alternative 1: Seven samples of the sewage sludge that is used or disposed shall be collected. The geometric mean of the density of fecal coliform in the samples must be less than either 2 million MPN/g of total solids (dry weight basis) or 2 million colony forming units/g (CFU/g) of total solids (dry weight basis).
2. Alternative 2: Sewage sludge that is used or disposed shall be treated in one of the processes to significantly reduce pathogens described in appendix B of 40 CFR 503.
3. Alternative 3: Sewage sludge that is used or disposed is to be treated in a process that is equivalent to a process to significantly reduce pathogens, as determined by the permitting authority.

Concentrated Animal Feeding Operation
An animal feeding operation which meets the criteria in appendix B of 40 CFR 122, or which the Director designates as such (40 CFR 122.23(b)(3)).

Concentrated Aquatic Animal Production Facility
A hatchery, fish farm, or other facility which meets the criteria in appendix C of 40 CFR 122, or which the Director designates as such (40 CFR 122.24(b)).

Contaminate an Aquifer
To introduce a substance that causes the maximum contaminant level for nitrate in 40 CFR 141.62(b) to be exceeded in the ground water or that causes the existing concentration of nitrate in ground water to increase when the existing concentration of nitrate in the ground water exceeds the maximum contaminant level for nitrate in 40 CFR 141.62(b) (40 CFR 503.21).

Contiguous Zone
The entire zone established by the United States under Article 24 of the Convention on the Territorial Sea and the Contiguous Zone (40 CFR 122.2).

Continuous Discharge
A "discharge" which occurs without interruption throughout the operating hours of the facility, except for infrequent shutdowns for maintenance, process changes, or other similar activities (40 CFR 122.2).

Control Efficiency
The mass of a pollutant in the sewage sludge fed to an incinerator minus the mass of that pollutant in the exit gas from the incinerator stack divided by the mass of the pollutant in the sewage sludge fed to the incinerator (40 CFR 503.41).

Conventional Pollutants
The following comprise the list of conventional pollutants designated pursuant to section 304(a)(4) of the Act (40 CFR 401.16):
1. Biochemical oxygen demand (BOD)
2. Total suspended solids (nonfilterable) (TSS)
3. pH
4. Fecal coliform
5. Oil and grease

Co-permittee
A permittee to a NPDES permit that is only responsible for permit conditions relating to the discharge for which it is an operator (40 CFR 122.26(b)(1)).

Cover
Soil or other material used to cover sewage sludge placed on an active sewage sludge unit (40 CFR 503.21).

Cover Crop
A small grain crop, such as oats, wheat, or barley, not grown for harvest (40 CFR 503.9(d)).

Cumulative Pollutant Loading Rate
The maximum amount of an inorganic pollutant that can be applied to an area of land (40 CFR 503.11).

CWA
Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972) (40 CFR 122.2).

CWA and Regulations
The Clean Water Act (CWA) and applicable regulations promulgated thereunder. In the case of an approved state program, it includes state program requirements (40 CFR 122.2).

Daily Discharge
The "discharge of a pollutant" measured during a calendar day or any 24-h period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the "daily discharge" is calculated as the average measurement of the pollutant over the day (40 CFR 122.2).

Density of Microorganisms
The number of microorganisms per unit mass of total solids (dry weight) in the sewage sludge (40 CFR 503.31).

Designated Project Area
The portions of the waters of the United States within which the permittee or permit applicant plans to confine the cultivated species, using a method or plan or operation (including, but not limited to, physical confinement) which, on the basis of reliable scientific evidence, is expected to ensure that specific individual organisms comprising an aquaculture crop will enjoy increased growth attributable to the discharge of pollutants, and be harvested within a defined geographic area (40 CFR 122.25(b)(2)).

Direct Discharge
The discharge of a pollutant (40 CFR 122.2).

Director
The U.S. EPA or authorized regulatory agency, as the context requires, or an authorized representative. When there is no "approved state program," and there is an U.S. EPA administered program, "Director" means the Regional Administrator. When there is an approved state program, "Director" normally means the State Director. (40 CFR 122.2).

Director
The chief administrative officer of a state or Interstate water pollution control agency with an NPDES permit program approved pursuant to section 402(b) of the Act and an approved state pretreatment program (40 CFR 403.3(e)).

Discharge
When used without qualification means the "discharge of a pollutant" (40 CFR 122.2).

Discharge Monitoring Report ("DMR")
The U.S. EPA uniform national form, including any subsequent additions, revisions, or modifications for the reporting of self-monitoring results by permittees. DMRs must be used by "approved states" as well as by U.S. EPA. U.S. EPA will supply DMRs to any approved state upon request. The U.S. EPA national forms may be modified to substitute the state Agency name, address, logo, and other similar information, as appropriate, in place of U.S. EPA's (40 CFR 122.2).

Discharge of a Pollutant
This means (40 CFR 122.2):

1. any addition of any "pollutant" or combination of pollutants to "waters of the United States" from any "point source," or
2. any addition of any pollutant or combination of pollutants to the waters of the "contiguous zone" or the ocean from any point source other than a vessel or other floating craft which is being used as a means of transportation.

This definition includes additions of pollutants into waters of the United States from: surface runoff which is collected or channeled by man; discharges through pipes, sewers, or other conveyances owned by a state, municipality, or other person which do not lead to a treatment works; and discharges through pipes, sewers, or other conveyances, leading into privately owned treatment works. This term does not include an addition of pollutants by any "indirect discharger."

Dispersion Factor
The ratio of the increase in the ground level ambient air concentration for a pollutant at or beyond the property line of the site where the sewage sludge incinerator is located to the mass emission rate for the pollutant from the incinerator stack (40 CFR 503.41).

Displacement
The relative movement of any two sides of a fault measured in any direction (40 CFR 503.21).

Domestic Septage
This is either liquid or solid material removed from a septic tank, cesspool, portable toilet, Type III marine sanitation device, or similar treatment works that receives only domestic sewage. Domestic septage does not include liquid or solid material removed from a septic tank, cesspool, or similar treatment works that receives either commercial wastewater or industrial wastewater and does not include grease removed from a grease trap at a restaurant (40 CFR 503.9(f)).

Domestic Sewage
Waste and wastewater from humans or household operations that is discharged to or otherwise enters a treatment works (40 CFR 503.9(g)).

Draft Permit
A document prepared under 40 CFR 124.6 indicating the Director's tentative decision to issue or deny, modify, revoke and reissue, terminate, or reissue a "permit." A notice of intent to terminate a permit, and a notice of intent to deny a permit, as discussed in 40 CFR 124.5, are types of "draft permits." A denial of a request for modification, revocation and reissuance, or termination, as discussed in 40 CFR 124.5, is not a "draft permit." A "proposed permit" is not a "draft permit" (40 CFR 122.2).

Dry Weight Basis
Calculated on the basis of having been dried at 105 ^{o}C until reaching a constant mass (i.e., essentially 100 percent solids content) (40 CFR 503.9(h)).

Effluent Limitation
Any restriction imposed by the Director on quantities, discharge rates, and concentrations of "pollutants" which are "discharged" from "point source" into "waters of the United States," the waters of the "contiguous zone," or the ocean (40 CFR 122.2).

Effluent Limitation
Any restriction established by the Administrator on quantities, rates, and concentrations of chemical, physical, biological, and other constituents which are discharged from point sources, other than new sources, into navigable waters, the water of the contiguous zone, or the ocean (40 CFR 401.11).

Effluent Limitations Guidelines
A regulation published by the Administrator under section 304(b) of CWA to adopt or revise "effluent limitations" (40 CFR 122.2).

Effluent Limitations Guidelines
Any effluent limitations guidelines issued by the Administrator pursuant to section 304(b) of the Act (40 CFR 401.11).

Environmental Protection Agency ("U.S. EPA")
The United States Environmental Protection Agency (40 CFR 122.2 and 40 CFR 401.11).

Equivalent System
A wastewater treatment system that is demonstrated in literature, treatability tests or self-monitoring data to remove a similar level of pesticide active ingredient (PAI) or priority pollutants as the applicable appropriate pollution control technology listed in Table 10 to 40 CFR 455 (40 CFR 455.10).

Excursion
An unintentional and temporary incident in which the pH value of discharge wastewater exceeds the range set forth in the applicable effluent limitations guidelines (40 CFR 401.17 (c)).

Exempted Sewage Sludge
The following are types of sewage sludge and activities which are exempted from meeting the requirements outlined in 40 CFR 503(40 CFR 503.6):

1. processes used to treat domestic sewage or processes used to treat sewage sludge prior to final use except for the standards on pathogen and vector reduction in 40 CFR 503.32 and 503.33;
2. sewage sludge co-fired in an incinerator with other wastes or for the incinerator in which sewage sludge and other wastes are co-fired;
3. sludge generated at an industrial facility during the treatment of industrial wastewater, including sewage sludge generated during the treatment of industrial wastewater combined with domestic sewage;
4. sewage sludge determined to be hazardous;
5. sewage sludge with a concentration of PCBs equal to greater than 50 mg/kg of total solids (dry weight basis);
6. ash generated during the firing of sewage sludge in a sewage sludge incinerator;
7. grit (i.e., sand, gravel, cinders, or other material with high specific gravity) or screenings (e.g., relatively large materials such as rags) generated during preliminary treatment of domestic sewage in a treatment works;
8. sludge generated during the treatment of either surface water or groundwater used for drinking water;
9. commercial septage, industrial septage, a mixture of domestic septage and commercial septage, or a mixture of domestic septage and industrial septage.

Existing Source
Any source which is not a new source or a new discharger (40 CFR 122.29(a)(3)).

Facilities or Equipment
Buildings, structures, process or production equipment or machinery which form a permanent part of the new source and which will be used in its operation, if these facilities or equipment are of such value as to represent a substantial commitment to construct. It excludes facilities or equipment used in connection with feasibility, engineering, and design studies regarding the source or water pollution treatment for the source (40 CFR 122.29(a)(5)).

Facility or Activity
Any NPDES "point source" or any other facility or activity (including land or appurtenances thereto) that is subject to regulation under the NPDES program (40 CFR 122.2).

Fault
A fracture or zone of fractures in any materials along which strata on one side are displaced with respect to strata on the other side (40 CFR 503.21).

Federal Indian Reservation
All land within the limits of any Indian reservation under the jurisdiction of the United States Government, notwithstanding the issuance of any patent, and including rights-of-way running through the reservation (40 CFR 122.2).

Feed Crops
Crops produced primarily for consumption by animals (40 CFR 503.9(j)).

Fiber Crops
Crops such as flax and cotton (40 CFR 503.9(k)).

Final Cover
The last layer of soil or other material placed on a sewage sludge unit at closure (40 CFR 503.21).

Fluidized Bed Incinerator
An enclosed device in which organic matter and inorganic matter in sewage sludge are combusted in a bed of particles suspended in the combustion chamber gas (40 CFR 503.41).

Forest
A tract of land thick with trees and underbrush (40 CFR 503.11).

Food Crops
Crops consumed by humans. These include, but are not limited to, fruits, vegetables, and tobacco (40 CFR 503.9(l)).

General Permit
An NPDES "permit" issued under 40 CFR 122.28 authorizing a category of discharges under the CWA within a geographical area (40 CFR 122.2).

Ground Water
Water below the land surface in the saturated zone (40 CFR 503.9(m)).

Hazardous Substance
Any substance designated under 40 CFR 116 pursuant to section 311 of CWA (40 CFR 122.2).

Holocene Time
The most recent epoch of the Quaternary period, extending from the end of the Pleistocene epoch to the present (40 CFR 503.21).

Hourly Average
The arithmetic mean of all measurements taken during an hour. At least two measurements must be taken during the hour (40 CFR 503.41).

Illicit Discharge
Any discharge to a municipal separate storm sewer that is not composed entirely of storm water except discharges pursuant to a NPDES permit (other than the NPDES permit for discharges from the municipal separate storm sewer) and discharges resulting from fire fighting activities (40 CFR 122.26(b)(2)).

Incineration
The combustion of organic matter and inorganic matter in sewage sludge by high temperatures in an enclosed device (40 CFR 503.41).

Incinerator Operating Combustion Temperature
The arithmetic mean of the temperature readings in the hottest zone of the furnace recorded in a day (24 h) when the temperature is averaged and recorded at least hourly during the hours the incinerator operates in a day (40 CFR 503.41).

Incorporated Place
The District of Columbia, or a city, town, township, or village that is incorporated under the laws of the state in which it is located (40 CFR 122.26(b)(3)).

Indian Country
This means (40 CFR 122.2):

1. All land within the limits of any Indian reservation under the jurisdiction of the United States Government, notwithstanding the issuance of any patent, and, including rights-of-way running through the reservation;

2. All dependent Indian communities within the borders of the United States whether within the originally or subsequently acquired territory thereof, and whether within or without the limits of a state; and
3. All Indian allotments, the Indian titles to which have not been extinguished, including rights-of-way running through the same.

Indian Tribe
Any Indian Tribe, band, group, or community recognized by the Secretary of the Interior and exercising governmental authority over a federal Indian reservation (40 CFR 122.2).

Indirect Discharge or Discharge
The introduction of pollutants into a POTW from any non-domestic source regulated under section 307(b), (c) or (d) of the Act (40 CFR 403.3(g)).

Indirect Discharger
A nondomestic discharger introducing "pollutants" to a "publicly owned treatment works" (40 CFR 122.2).

Industrial User or User
A source of indirect discharge (40 CFR 403.3(h)).

Industrial Wastewater
Wastewater generated in a commercial or industrial process (40 CFR 503.9(n)).

Interference
A discharge which, alone or in conjunction with a discharge or discharges from other sources, both (40 CFR 403.3(i)):

1. inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and
2. is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent state or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including state regulations contained in any state sludge management plan prepared pursuant to subtitle D of the SWDA), the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act.

Interstate Agency
An agency of two or more states established by or under an agreement or compact approved by the Congress, or any other agency of two or more states having substantial powers or duties pertaining to the control of pollution as determined and approved by the Administrator under the CWA and regulations (40 CFR 122.2).

Land Application
The spraying or spreading of sewage sludge onto the land surface; the injection of sewage sludge below the land surface; or the incorporation of sewage sludge into the soil so that the sewage sludge can either condition the soil or fertilize crops or vegetation grown in the soil (40 CFR 503.11).

Land With a High Potential for Public Exposure
Land that the public uses frequently. This includes, but is not limited to, a public contact site and a reclamation site located in a populated area (e.g., a construction site located in a city) (40 CFR 503.31).

Land With a Low Potential for Public Exposure
Land that the public uses infrequently. This includes, but is not limited to, agricultural land, forest, and a reclamation site located in an unpopulated area (e.g., a strip mine located in a rural area) (40 CFR 503.31).

Leachate Collection System
A system or device installed immediately above a liner that is designed, constructed, maintained, and operated to collect and remove leachate from a sewage sludge unit (40 CFR 503.21).

Liner
Soil or synthetic material that has a hydraulic conductivity of 1 x 10^{-7} cm/s or less (40 CFR 503.21).

Log Sorting and Log Storage Facilities
Facilities whose discharges result from the holding of unprocessed wood, for example, logs or roundwood with bark or after removal of bark held in self-contained bodies of water (mill ponds or log ponds) or stored on land where water is applied intentionally on the logs (wet decking). (See 40 CFR 429, subpart I, including the effluent limitations guidelines) (40 CFR 122.27(b)(3)).

Lower Explosive Limit for Methane Gas
The lowest percentage of methane gas in air, by volume, that propagates a flame at 25 ^{o}C and atmospheric pressure (40 CFR 503.21).

Major Facility
Any NPDES "facility or activity" classified as such by the U.S. EPA, or, in the case of "approved state programs," the U.S. EPA in conjunction with the state authorized regulatory agency (40 CFR 122.2).

Maximum Daily Discharge Limitation
The highest allowable "daily discharge" (40 CFR 122.2).

Monthly Average
The arithmetic mean of all measurements taken during the month (40 CFR 503.11).

Monthly Average
The arithmetic mean of the hourly averages for the hours a sewage sludge incinerator operates during the month (40 CFR 503.41).

Municipality
A city, town, borough, county, parish, district, association, or other public body created by or under state law and having jurisdiction over disposal of sewage, industrial wastes, or other wastes, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of CWA (40 CFR 122.2).

Municipality
A city, town, borough, county, parish, district, association, or other public body (including an intermunicipal Agency of two or more of the foregoing entities) created by or under state law; an Indian tribe or an authorized Indian tribal organization having jurisdiction over sewage sludge management; or a designated and approved management Agency under section 208 of the CWA, as amended. The definition includes a special district created under state law, such as a water district, sewer district, sanitary district, utility district, drainage district, or similar entity, or an integrated waste management facility as defined in section 201(e) of the CWA, as amended, that has as one of its principal responsibilities the treatment, transport, use, or disposal of sewage sludge (40 CFR 503.9(o)).

National Pollutant Discharge Elimination System (NPDES)
The national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under sections 307, 402, 318, and 405 of CWA. The term includes an "approved program" (40 CFR 122.2).

National Pretreatment Standard, Pretreatment Standard, or Standard
Any regulation containing pollutant discharge limits promulgated by the U.S. EPA in accordance with section 307 (b) and (c) of the Act, which applies to Industrial Users. This term includes prohibitive discharge limits established pursuant to 40 CFR 403.5 (40 CFR 403.3(j)).

Navigable Waters
This includes: all navigable waters of the United States; tributaries of navigable waters of the United States; interstate waters; intrastate lakes, rivers, and streams which are utilized by interstate travelers for recreational or other purposes; intrastate lakes, rivers, and streams from which fish or shellfish are taken and sold in interstate commerce; and intrastate lakes, rivers, and streams which are utilized for industrial purposes by industries in interstate commerce. Navigable waters do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for the purposes of the Clean Water Act, the final authority regarding Clean Water Act jurisdiction remains with U.S. EPA (40 CFR 401.11).

New Discharger
Any building, structure, facility, or installation (40 CFR 122.2):
1. from which there is or may be a "discharge of pollutants;"
2. that did not commence the "discharge of pollutants" at a particular "site" prior to August 13, 1979;
3. which is not a "new source;" and
4. which has never received a finally effective NDPES permit for discharges at that "site."

This definition includes an "indirect discharger" which commences discharging into "waters of the United States" after August 13, 1979. It also includes any existing mobile point source (other than an offshore or coastal oil and gas exploratory drilling rig or a coastal oil and gas developmental drilling rig) such as a seafood processing rig, seafood processing vessel, or aggregate plant, that begins discharging at a "site" for which it does not have a permit; and any offshore or coastal mobile oil and gas exploratory drilling rig or coastal mobile oil and gas developmental drilling rig that commences the discharge of pollutants after August 13, 1979, at a "site" under U.S. EPA's permitting jurisdiction for which it is not covered by an individual or general permit and which is located in an area determined by the U.S. EPA or authorized regulatory agency in the issuance of a final permit to be an area of biological concern. In determining whether an area is an area of biological concern, the U.S. EPA or authorized regulatory agency shall consider the factors specified in 40 CFR 125.122(a) (1) through (10). An offshore or coastal mobile exploratory drilling rig or coastal mobile developmental drilling rig will be considered a "new discharger" only for the duration of its discharge in an area of biological concern.

New Source
Any building, structure, facility, or installation from which there is or may be a "discharge of pollutants," the construction of which commenced (40 CFR 122.2):
1. after promulgation of standards of performance under section 306 of CWA which are applicable to such source, or
2. after proposal of standards of performance in accordance with section 306 of CWA which are applicable to such source, but only if the standards are promulgated in accordance with section 306 within 120 days of their proposal.

New Source
Any building, structure, facility or installation from which there is or may be a discharge of pollutants, the construction of which commenced after the publication of proposed regulations prescribing a standard of performance under section 306 of the Act which will be applicable to such source if such standard is thereafter promulgated in accordance with section 306 of the Act (40 CFR 401.11).

New Source
Any building, structure, facility or installation from which there is or may be a discharge of pollutants, the construction of which commenced after the publication of proposed Pretreatment Standards under section 307(c) of the Act which will be applicable to such source if such Standards are thereafter promulgated in accordance with that section, provided that (40 CFR 403.3(k)):
1. the building, structure, facility or installation is constructed at a site at which no other source is located; or
2. the building, structure, facility or installation totally replaces the process or production equipment that causes the discharge of pollutants at an existing source; or
3. the production or wastewater generating processes of the building, structure, facility or installation are substantially independent of an existing source at the same site. In determining whether these are substantially independent, factors such as the extent to which the new facility is integrated with the existing plant, and the

extent to which the new facility is engaged in the same general type of activity as the existing source should be considered.

Construction on a site at which an existing source is located results in a modification rather than a new source if the construction does not create a new building, structure, facility or installation meeting the criteria of paragraphs b or c but otherwise alters, replaces, or adds to existing process or production equipment.

Construction of a new source has commenced if the owner or operator has:

1. begun, or caused to begin as part of a continuous onsite construction program:
   a) any placement, assembly, or installation of facilities or equipment; or
   b) significant site preparation work including clearing, excavation, or removal of existing buildings, structures, or facilities which is necessary for the placement, assembly, or installation of new source facilities or equipment; or
2. entered into a binding contractual obligation for the purchase of facilities or equipment which are intended to be used in its operation within a reasonable time. Options to purchase or contracts which can be terminated or modified without substantial loss, and contracts for feasibility, engineering, and design studies do not constitute a contractual obligation.

Noncontact Cooling Water
Water used for cooling which does not come into direct contact with any raw material, intermediate product, waste product or finished product (40 CFR 401.11).

Noncontact Cooling Water Pollutants
Pollutants present in noncontact cooling waters (40 CFR 401.11).

Non-Conventional Pollutants
Parameters that are neither conventional pollutants as defined in 40 CFR 401.16, nor toxic pollutants as defined in 40 CFR 401.15 (see Appendix A of this document) (40 CFR 439.1(k)).

NPDES Permit or Permit
A permit issued to a POTW pursuant to section 402 of the Act (40 CFR 403.3(l)).

NPDES Permit Exclusions
The following discharges do not require a NPDES permit (40 CFR 122.3):

1. any discharge of sewage from vessels, effluent from properly functioning marine engines, laundry, shower, and galley sink wastes, or any other discharge incidental to the normal operation of a vessel. This exclusion does not apply to rubbish, trash, garbage, or other such materials discharged overboard; nor to other discharges when the vessel is operating in a capacity other than as a means of transportation such as when used as an energy or mining facility, a storage facility or a seafood processing facility, or when secured to a storage facility or a seafood processing facility, or when secured to the bed of the ocean, contiguous zone or waters of the United States for the purpose of mineral or oil exploration or development
2. discharges of dredged or fill material into waters of the United States which are regulated under section 404 of CWA
3. the introduction of sewage, industrial wastes or other pollutants into POTW by indirect dischargers. Plans or agreements to switch to this method of disposal in the future do not relieve dischargers of the obligation to have and comply with permits until all discharges of pollutants to waters of the United States are eliminated. This exclusion does not apply to the introduction of pollutants to privately owned treatment works or to other discharges through pipes, sewers, or other conveyances owned by a state, municipality, or other party not leading to treatment works
4. any discharge in compliance with the instructions of an On-Scene Coordinator pursuant to 40 CFR 300 (The National Oil and Hazardous Substances Pollution Contingency Plan) or 33 CFR 153.10(e) (Pollution by Oil and Hazardous Substances)
5. any introduction of pollutants from non point-source agricultural and silvicultural activities, including storm water runoff from orchards, cultivated crops, pastures, range lands, and forest lands, but not discharges from

concentrated animal feeding operations, discharges from concentrated aquatic animal production facilities, discharges to aquaculture projects, and discharges from silvicultural point sources

6. return flows from irrigated agriculture
7. discharges into a privately owned treatment works, except as the Director may otherwise require under 40 CFR 122.44(m).

NPDES State
A state (as defined in 40 CFR 122.2) or Interstate water pollution control agency with an NPDES permit program approved pursuant to section 402(b) of the Act (40 CFR 403.3(m)).

Other Container
Either an open or closed receptacle. This includes, but is not limited to, a bucket, a box, a carton, and a vehicle or trailer with a load capacity of one metric ton or less (40 CFR 503.11).

Overburden
Any material of any nature, consolidated or unconsolidated, that overlies a mineral deposit, excluding topsoil or similar naturally-occurring surface materials that are not disturbed by mining operations (40 CFR 122.26(b)(10)).

Owner or Operator
The owner or operator of any "facility or activity" subject to regulation under the NPDES program (40 CFR 122.2).

Pass Through
A discharge which exits the POTW into waters of the United States in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) (40 CFR 403.3(n)).

Pasture
Land on which animals feed directly on feed crops such as legumes, grasses, grain stubble, or stover (40 CFR 503.11).

Pathogenic Organisms
Disease-causing organisms. These include, but are not limited to, certain bacteria, protozoa, viruses, and viable helminth ova (40 CFR 503.31).

Performance Test Combustion Temperature
The arithmetic mean of the average combustion temperature in the hottest zone of the furnace for each of the runs in a performance test (40 CFR 503.41).

Permit
An authorization, license, or equivalent control document issued by U.S. EPA or an "approved state" to implement the requirements of this 40 CFR 122 and 40 CFR 123 and 124. "Permit" includes an NPDES "general permit" (40 CFR 122.28). Permit does not include any permit which has not yet been the subject of final agency action, such as a "draft permit" or a "proposed permit" (40 CFR 122.2).

Permitting Authority
Either U.S. EPA or a state with an U.S. EPA-approved sludge management program (40 CFR 503.9(p)).

Person
An individual, association, partnership, corporation, municipality, state or federal agency, or an agent or employee thereof (40 CFR 122.2 and 503.9(q)).

Person Who Prepares Sewage Sludge
Either the person who generates sewage sludge during the treatment of domestic sewage in a treatment works or the person who derives a material from sewage sludge (40 CFR 503.9(r)).

Place Sewage Sludge or Sewage Sludge Placed
Disposal of sewage sludge on a surface disposal site (40 CFR 503.9(s)).

Point Source
Any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural storm water runoff. (See 40 CFR 122.3) (40 CFR 122.2 and 40 CFR 401.11).

Pollutant
Dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials (except those regulated under the Atomic Energy Act of 1954, as amended (42 U.S.C. 2011 et seq.)), heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water. It does not mean:

1. sewage from vessels; or
2. water, gas, or other material which is injected into a well to facilitate production of oil or gas, or water derived in association with oil and gas production and disposed of in a well, if the well used either to facilitate production or for disposal purposes is approved by authority of the state in which the well is located, and if the state determines that the injection or disposal will not result in the degradation of ground or surface water resources.

Note: Radioactive materials covered by the Atomic Energy Act are those encompassed in its definition of source, byproduct, or special nuclear materials. Examples of materials not covered include radium and accelerator-produced isotopes. See Train v. Colorado Public Interest Research Group, Inc., 426 U.S. 1 (1976) (40 CFR 122.2).

Pollutant
Dredged spoil, solid waste, incinerator residue, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water. It does not mean (40 CFR 401.11(f)):

1. sewage from vessels; or
2. water, gas, or other material which is injected into a well to facilitate production of oil or gas, or water derived in association with oil and gas production and disposed of in a well, if the well, used either to facilitate production or for disposal purposes is approved by authority of the state in which the well is located, and if such state determines that such injection or disposal will not result in the degradation of ground or surface water resources.

Pollutant
An organic substance, an inorganic substance, a combination of organic and inorganic substances, or a pathogenic organism that, after discharge and upon exposure, ingestion, inhalation, or assimilation into an organism either directly from the environment or indirectly by ingestion through the food chain, could, on the basis of information available to the Administrator of U.S. EPA, cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunction in reproduction), or physical deformations in either organisms or offspring of the organisms (40 CFR 503.9(t)).

Pollutant Limit
A numerical value that describes the amount of a pollutant allowed per unit amount of sewage sludge (e.g., milligrams per kilogram of total solids); the amount of a pollutant that can be applied to a unit area of land (e.g., kilograms per hectare); or the volume of a material that can be applied to a unit area of land (e.g., gallons per acre) (40 CFR 503.9(u)).

Pollution
The manmade or man induced alteration of the chemical, physical, biological and radiological integrity of water (40 CFR 401.11).

POTW Treatment Plant
That portion of the POTW which is designed to provide treatment (including recycling and reclamation) of municipal sewage and industrial waste (40 CFR 403.3(p)).

Pretreatment
The reduction of the amount of pollutants, the elimination of pollutants, or the alteration of the nature of pollutant properties in wastewater prior to or in lieu of discharging or otherwise introducing such pollutants into a POTW. The reduction or alteration may be obtained by physical, chemical or biological processes, process changes or by other means, except as prohibited by 40 CFR 403.6(d). Appropriate pretreatment technology includes control equipment, such as equalization tanks or facilities, for protection against surges or slug loadings that might interfere with or otherwise be incompatible with the POTW. However, where wastewater from a regulated process is mixed in an equalization facility with unregulated wastewater or with wastewater from another regulated process, the effluent from the equalization facility must meet an adjusted pretreatment limit calculated in accordance with 40 CFR 403.6(e) (40 CFR 403.3(q)).

Pretreatment Requirements
Any substantive or procedural requirement related to Pretreatment, other than a National Pretreatment Standard, imposed on an Industrial User (40 CFR 403.3(r)).

Primary Industry Category
Any industry category listed in the NRDC settlement agreement (Natural Resources Defense Council et al. v. Train, 8 E.R.C. 2120 (D.D.C. 1976), modified 12 E.R.C. 1833 (D.D.C. 1979)); also listed in appendix A of 40 CFR 122 (see Appendix B of this document) (40 CFR 122.2).

Privately Owned Treatment Works
Any device or system which is (40 CFR 122.2):
a) used to treat wastes from any facility whose operator is not the operator of the treatment works, and
b) not a "POTW."

Process Wastewater
Any water which, during manufacturing or processing, comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, byproduct, or waste product (40 CFR 122.2 and 401.11)

Process Wastewater Pollutants
Pollutants present in process wastewater (40 CFR 401.11).

Proposed Permit
A state NPDES "permit" prepared after the close of the public comment period (and, when applicable, any public hearing and administrative appeals) which is sent to U.S. EPA for review before final issuance by the state. A "proposed permit" is not a "draft permit" (40 CFR 122.2).

Public Contact Site
Land with a high potential for contact by the public. This includes, but is not limited to, public parks, ball fields, cemeteries, plant nurseries, turf farms, and golf courses (40 CFR 503.11).

Publicly Owned Treatment Works (POTW)
Any device or system used in the treatment (including recycling and reclamation) of municipal sewage or industrial wastes of a liquid nature which is owned by a "state" or "municipality." This definition includes sewers, pipes, or other conveyances only if they convey wastewater to a POTW providing treatment (40 CFR 122.2).

Publicly Owned Treatment Works or POTW
A treatment works as defined by section 212 of the Act, which is owned by a state or municipality (as defined by section 502(4) of the Act). This definition includes any devices and systems used in the storage, treatment, recycling

and reclamation of municipal sewage or industrial wastes of a liquid nature. It also includes sewers, pipes and other conveyances only if they convey wastewater to a POTW Treatment Plant. The term also means the municipality as defined in section 502(4) of the Act, which has jurisdiction over the Indirect Discharges to and the discharges from such a treatment works (40 CFR 403.3(o)).

Qualified Ground-Water Scientist
An individual with a baccalaureate or post-graduate degree in the natural sciences or engineering who has sufficient training and experience in ground-water hydrology and related fields, as may be demonstrated by state registration, professional certification, or completion of accredited university programs, to make sound professional judgments regarding ground-water monitoring, pollutant fate and transport, and corrective action (40 CFR 503.21).

Range Land
Open land with indigenous vegetation (40 CFR 503.11).

Reclamation Site
Drastically disturbed land that is reclaimed using sewage sludge. This includes, but is not limited to, strip mines and construction sites (40 CFR 503.11).

Recommencing Discharger
A source which recommences discharge after terminating operations (40 CFR 122.2).

Regional Administrator
The Regional Administrator of the appropriate Regional Office of the Environmental Protection Agency or the authorized representative of the Regional Administrator (40 CFR 122.2 and 40 CFR 403.3(s)).

Risk Specific Concentration
The allowable increase in the average daily ground level ambient air concentration for a pollutant from the incineration of sewage sludge at or beyond the property line of the site where the sewage sludge incinerator is located (40 CFR 503.41).

Rock Crushing and Gravel Washing Facilities - facilities which process crushed and broken stone, gravel, and riprap (See 40 CFR 436, subpart B, including the effluent limitations guidelines) (40 CFR 122.27(b)(2)).

Runoff
Rainwater, leachate, or other liquid that drains overland on any part of a land surface and runs off of the land surface (40 CFR 503.9(v)).

Runoff Coefficient
The fraction of total rainfall that will appear at a conveyance as runoff (40 CFR 122.26(b)(11)).

Schedule of Compliance
A schedule of remedial measures included in a "permit," including an enforceable sequence of interim requirements (for example, actions, operations, or milestone events) leading to compliance with the CWA and regulations (40 CFR 122.2).

Secondary Industry Category
Any industry category which is not a "primary industry category" (40 CFR 122.2).

Secretary
The Secretary of the Army, acting through the Chief of Engineers (40 CFR 122.2).

Seismic Impact Zone
An area that has a 10 percent or greater probability that the horizontal ground level acceleration of the rock in the area exceeds 0.10 gravity once in 250 yr (40 CFR 503.21).

Septage
The liquid and solid material pumped from a septic tank, cesspool, or similar domestic sewage treatment system, or a holding tank when the system is cleaned or maintained (40 CFR 122.2).

Severe Property Damage
Substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production (40 CFR 122.41(m)(1)(ii) and 403.17(a)(2)).

Sewage From Vessels
Human body wastes and the wastes from toilets and other receptacles intended to receive or retain body wastes that are discharged from vessels and regulated under section 312 of CWA, except that with respect to commercial vessels on the Great Lakes this term includes graywater. For the purposes of this definition, "graywater" means galley, bath, and shower water (40 CFR 122.2).

Sewage Sludge
Any solid, semi-solid, or liquid residue removed during the treatment of municipal wastewater or domestic sewage. Sewage sludge includes, but is not limited to, solids removed during primary, secondary, or advanced wastewater treatment, scum, septage, portable toilet pumpings, type III marine sanitation device pumpings (33 CFR 159), and sewage sludge products. Sewage sludge does not include grit or screenings, or ash generated during the incineration of sewage sludge (40 CFR 122.2).

Sewage Sludge
Solid, semi-solid, or liquid residue generated during the treatment of domestic sewage in a treatment works. Sewage sludge includes, but is not limited to, domestic septage; scum or solids removed in primary, secondary, or advanced wastewater treatment processes; and a material derived from sewage sludge. Sewage sludge does not include ash generated during the firing of sewage sludge in a sewage sludge incinerator or grit and screenings generated during preliminary treatment of domestic sewage in a treatment works (40 CFR 503.9(w)).

Sewage Sludge Feed Rate
Either the average daily amount of sewage sludge fired in all sewage sludge incinerators within the property line of the site where the sewage sludge incinerators are located for the number of days in a 365 day period that each sewage sludge incinerator operates, or the average daily design capacity for all sewage sludge incinerators within the property line of the site where the sewage sludge incinerators are located (40 CFR 503.41).

Sewage Sludge Incinerator
An enclosed device in which only sewage sludge and auxiliary fuel are fired (40 CFR 503.41).

Sewage Sludge Unit
Land on which only sewage sludge is placed for final disposal. This does not include land on which sewage sludge is either stored or treated. Land does not include waters of the United States, as defined in 40 CFR 122.2 (40 CFR 503.21).

Sewage Sludge Unit Boundary
The outermost perimeter of an active sewage sludge unit (40 CFR 503.21).

Sewage Sludge Use or Disposal Practice
The collection, storage, treatment, transportation, processing, monitoring, use, or disposal of sewage sludge (40 CFR 122.2)

Significant Industrial User

Except as provided in paragraph 3, the term Significant Industrial User means (40 CFR 403.3(t)):

1. all industrial users subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR chapter I, subchapter N; and
2. any other industrial user that: discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, noncontact cooling and boiler blowdown wastewater); contributes a process waste stream which makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the Control Authority as defined in 40 CFR 403.12(a) on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement (in accordance with 40 CFR 403.8(f)(6))
3. upon a finding that an industrial user meeting the criteria in paragraph 2 has no reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement, the Control Authority (as defined in 40 CFR 403.12(a)) may at any time, on its own initiative or in response to a petition received from an industrial user or POTW, and in accordance with 40 CFR 403.8(f)(6), determine that such industrial user is not a significant industrial user.

Significant Materials

This includes, but is not limited to: raw materials; fuels; materials such as solvents, detergents, and plastic pellets; finished materials such as metallic products; raw materials used in food processing or production; hazardous substances designated under section 101(14) of CERCLA; any chemical the facility is required to report pursuant to section 313 of title III of SARA; fertilizers; pesticides; and waste products such as ashes, slag and sludge that have the potential to be released with storm water discharges (40 CFR 122.26(b)(12)).

Silvicultural Point Source

Any discernible, confined and discrete conveyance related to rock crushing, gravel washing, log sorting, or log storage facilities which are operated in connection with silvicultural activities and from which pollutants are discharged into waters of the United States. The term does not include nonpoint source silvicultural activities such as nursery operations, site preparation, reforestation and subsequent cultural treatment, thinning, prescribed burning, pest and fire control, harvesting operations, surface drainage, or road construction and maintenance from which there is natural runoff. However, some of these activities (such as stream crossing for roads) may involve point source discharges of dredged or fill material which may require a CWA section 404 permit (See 33 CFR 209.120 and 33 CFR 233) (40 CFR 122.27(b)(1)).

Site

The land or water area where any "facility or activity" is physically located or conducted, including adjacent land used in connection with the facility or activity (40 CFR 122.2).

Sludge-Only Facility

Any "treatment works treating domestic sewage" whose methods of sewage sludge use or disposal are subject to regulations promulgated pursuant to section 405(d) of the CWA, and is required to obtain a permit under 40 CFR 122.1(b)(3) (40 CFR 122.2).

Source

Any building, structure, facility, or installation from which there is or may be a discharge of pollutants (40 CFR 122.29(a)(2)).

Specific Oxygen Uptake Rate (SOUR)

The mass of oxygen consumed per unit time per unit mass of total solids (dry weight basis) in the sewage sludge (40 CFR 503.31).

Stack Height

The difference between the elevation of the top of a sewage sludge incinerator stack and the elevation of the ground at the base of the stack when the difference is equal to or less than 65 m. When the difference is greater than 65 m, stack height is the creditable stack height determined in accordance with 40 CFR 51.100 (ii) (40 CFR 503.41).

Standard of Performance
Any restriction established by the Administrator pursuant to section 306 of the Act on quantities, rates, and concentrations of chemical, physical, biological, and other constituents which are or may be discharged from new sources into navigable waters, the waters of the contiguous zone or the ocean (40 CFR 401.11).

Standards for Sewage Sludge Use or Disposal
The regulations promulgated pursuant to section 405(d) of the CWA which govern minimum requirements for sludge quality, management practices, and monitoring and reporting applicable to sewage sludge or the use or disposal of sewage sludge by any person (40 CFR 122.2).

State
Any of the 50 states, the District of Columbia, Guam, the Commonwealth of Puerto Rico, the Virgin Islands, American Samoa, the Commonwealth of the Northern Mariana Islands, the Trust Territory of the Pacific Islands, or an Indian Tribe as defined in these regulations which meets the requirements of 40 CFR 123.31(40 CFR 122.2).

State Director
The chief administrative officer of any state or interstate agency operating an "approved program," or the delegated representative of the State Director. If responsibility is divided among two or more state or interstate agencies, "State Director" means the chief administrative officer of the state or interstate agency authorized to perform the particular procedure or function to which reference is made (40 CFR 122.2).

State/U.S. EPA Agreement
An agreement between the Regional Administrator and the state which coordinates U.S. EPA and state activities, responsibilities and programs including those under the CWA programs (40 CFR 122.2).

Store or Storage of Sewage Sludge
Placement of sewage sludge on land on which the sewage sludge remains for two years or less. This does not include the placement of sewage sludge on land for treatment (40 CFR 503.9(y)).

Storm Water
Storm water runoff, snow melt runoff, and surface runoff and drainage (40 CFR 122.26(b)(13)).

Submission
1. A request by a POTW for approval of a Pretreatment Program to the U.S. EPA or a Director;
2. A request by a POTW to the U.S. EPA or a Director for authority to revise the discharge limits in categorical Pretreatment Standards to reflect POTW pollutant removals; or
3. A request to the U.S. EPA by an NPDES state for approval of its state pretreatment program (40 CFR 403.3(u)).

Surface Disposal Site
An area of land that contains one or more active sewage sludge units (40 CFR 503.21).

Total Dissolved Solids
The total dissolved (filterable) solids as determined by use of the method specified in 40 CFR 136 (40 CFR 122.2).

Total Hydrocarbons
The organic compounds in the exit gas from a sewage sludge incinerator stack measured using a flame ionization detection instrument referenced to propane (40 CFR 503.41).

Total Solids
The materials in sewage sludge that remain as residue when the sewage sludge is dried at 103 to 105 ^{o}C (40 CFR 503.31).

Toxic Pollutant
Any pollutant listed as toxic under section 307(a)(1) (see Appendix A of this document) or, in the case of "sludge use or disposal practices," any pollutant identified in regulations implementing section 405(d) of the CWA (40 CFR 122.2).

Treat or Treatment of Sewage Sludge
The preparation of sewage sludge for final use or disposal. This includes, but is not limited to, thickening, stabilization, and dewatering of sewage sludge. This does not include storage of sewage sludge (40 CFR 503.9(z)).

Treatment Works
Either a federally owned, publicly owned, or privately owned device or system used to treat (including recycle and reclaim) either domestic sewage or a combination of domestic sewage and industrial waste of a liquid nature (40 CFR 503.9(aa)).

Treatment Works Treating Domestic Sewage
A POTW or any other sewage sludge or wastewater treatment devices or systems, regardless of ownership (including federal facilities), used in the storage, treatment, recycling, and reclamation of municipal or domestic sewage, including land dedicated for the disposal of sewage sludge. This definition does not include septic tanks or similar devices. For purposes of this definition, "domestic sewage" includes waste and wastewater from humans or household operations that are discharged to or otherwise enter a treatment works. In states where there is no approved state sludge management program under section 405(f) of the CWA, the U.S. EPA or authorized regulatory agency may designate any person subject to the standards for sewage sludge use and disposal in 40 CFR 503 as a "treatment works treating domestic sewage," where he or she finds that there is a potential for adverse effects on public health and the environment from poor sludge quality or poor sludge handling, use or disposal practices, or where he or she finds that such designation is necessary to ensure that such person is in compliance with 40 CFR 503 (40 CFR 122.2).

Uncontrolled Sanitary Landfill
A landfill or open dump, whether in operation or closed, that does not meet the requirements for runon or runoff controls established pursuant to subtitle D of the Solid Waste Disposal Act (40 CFR 122.26(b)(15)).

Unstable Area
Land subject to natural or human-induced forces that may damage the structural components of an active sewage sludge unit. This includes, but is not limited to, land on which the soils are subject to mass movement (40 CFR 503.21).

Unstabilized Solids
Organic materials in sewage sludge that have not been treated in either an aerobic or anaerobic treatment process (40 CFR 503.31).

Upset
An exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation (40 CFR 122.41(n)(1)).

Upset
An exceptional incident in which there is unintentional and temporary noncompliance with categorical Pretreatment Standards because of factors beyond the reasonable control of the Industrial User. An Upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation (40 CFR 403.16(a)).

Variance
Any mechanism or provision under section 301 or 316 of CWA or under 40 CFR 125, or in the applicable "effluent limitations guidelines" which allows modification to or waiver of the generally applicable effluent limitation requirements or time deadlines of CWA. This includes provisions which allow the establishment of alternative limitations based on fundamentally different factors or on sections 301(c), 301(g), 301(h), 301(i), or 316(a) of CWA (40 CFR 122.2).

Vector Attraction
The characteristic of sewage sludge that attracts rodents, flies, mosquitoes, or other organisms capable of transporting infectious agents (40 CFR 503.31).

Vector Attraction Reduction Options
The following are vector attraction reduction options (40 CFR 503.33(b)):

1. The mass of volatile solids in the sewage sludge shall be reduced by a minimum of 38 percent (see calculation procedures in "Environmental Regulations and Technology--Control of Pathogens and Vector Attraction in Sewage Sludge", EPA-625/R-92/013, 1992, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268)
2. When the 38 percent volatile solids reduction requirement in paragraph 1 cannot be met for an anaerobically digested sewage sludge, vector attraction reduction can be demonstrated by digesting a portion of the previously digested sewage sludge anaerobically in the laboratory in a bench-scale unit for 40 additional days at a temperature between 30 and 37 ^{o}C. When at the end of the 40 days, the volatile solids in the sewage sludge at the beginning of that period is reduced by less than 17 percent, vector attraction reduction is achieved
3. When the 38 percent volatile solids reduction requirement in paragraph 1 cannot be met for an aerobically digested sewage sludge, vector attraction reduction can be demonstrated by digesting a portion of the previously digested sewage sludge that has a percent solids of two percent or less aerobically in the laboratory in a bench-scale unit for 30 additional days at 20 ^{o}C. When at the end of the 30 days, the volatile solids in the sewage sludge at the beginning of that period is reduced by less than 15 percent, vector attraction reduction is achieved
4. The specific oxygen uptake rate (SOUR) for sewage sludge treated in an aerobic process shall be equal to or less than 1.5 mg of oxygen per hour per gram of total solids (dry weight basis) at a temperature of 20 ^{o}C
5. Sewage sludge shall be treated in an aerobic process for 14 days or longer. During that time, the temperature of the sewage sludge shall be higher than 40 ^{o}C and the average temperature of the sewage sludge shall be higher than 45 ^{o}C
6. The pH of sewage sludge shall be raised to 12 or higher by alkali addition and, without the addition of more alkali, shall remain at 12 or higher for 2 h and then at 11.5 or higher for an additional 22 h
7. The percent solids of sewage sludge that does not contain unstabilized solids generated in a primary wastewater treatment process shall be equal to or greater than 75 percent based on the moisture content and total solids prior to mixing with other materials
8. The percent solids of sewage sludge that contains unstabilized solids generated in a primary wastewater treatment process shall be equal to or greater than 90 percent based on the moisture content and total solids prior to mixing with other materials
9. Sewage sludge shall be injected below the surface of the land. No significant amount of the sewage sludge shall be present on the land surface within 1 h after the sewage sludge is injected. When the sewage sludge that is injected below the surface of the land is Class A with respect to pathogens, the sewage sludge shall be injected below the land surface within 8 h after being discharged from the pathogen treatment process
10. Sewage sludge applied to the land surface or placed on an active sewage sludge unit shall be incorporated into the soil within 6 h after application to or placement on the land, unless otherwise specified by the permitting authority
11. When sewage sludge that is incorporated into the soil is Class A with respect to pathogens, the sewage sludge shall be applied to or placed on the land within 8 h after being discharged from the pathogen treatment process
12. Sewage sludge placed on an active sewage sludge unit shall be covered with soil or other material at the end of each operating day
13. The pH of domestic septage shall be raised to 12 or higher by alkali addition and, without the addition of more alkali, shall remain at 12 or higher for 30 min.

Volatile Solids
The amount of the total solids in sewage sludge lost when the sewage sludge is combusted at 550 ^{o}C in the presence of excess air (40 CFR 503.31).

Water Management Division Director
One of the Directors of the Water Management Divisions within the Regional offices of the Environmental Protection Agency or this person's delegated representative (40 CFR 403.3(f)).

Waters of The United States or Waters of The U.S.
1. all waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
2. all interstate waters, including interstate "wetlands;"
3. all other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, "wetlands," sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce including any such waters:
4. which are or could be used by interstate or foreign travelers for recreational or other purposes;
5. from which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
6. which are used or could be used for industrial purposes by industries in interstate commerce;
7. all impoundments of waters otherwise defined as waters of the United States under this definition;
8. tributaries of waters identified in paragraphs (1) through (4) of this definition;
9. the territorial sea; and
10. "wetlands" adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (1) through (6) of this definition.

Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA (other than cooling ponds as defined in 40 CFR 423.11(m) which also meet the criteria of this definition) are not waters of the United States. This exclusion applies only to manmade bodies of water which neither were originally created in waters of the United States (such as disposal area in wetlands) nor resulted from the impoundment of waters of the United States. [See Note 1 of this section.] Waters of the United States do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for the purposes of the Clean Water Act, the final authority regarding Clean Water Act jurisdiction remains with U.S. EPA (40 CFR 122.2).

Wet Electrostatic Precipitator
An air pollution control device that uses both electrical forces and water to remove pollutants in the exit gas from a sewage sludge incinerator stack (40 CFR 503.41).

Wet Scrubber
An air pollution control device that uses water to remove pollutants in the exit gas from a sewage sludge incinerator stack (40 CFR 503.41).

Wetlands
Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (40 CFR 122.2).

Wetlands
Those areas that are inundated or saturated by surface water or ground water at a frequency and duration to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (40 CFR 503.9(bb)).

Whole Effluent Toxicity
The aggregate toxic effect of an effluent measured directly by a toxicity test (40 CFR 122.2).

Typical Records To Review

- NPDES Permit
- NPDES Permit applications (new or renewal)
- Discharge monitoring reports for the past year
- Laboratory records and procedures and U.S. EPA QA results
- Monthly operating reports for wastewater treatment facilities
- Flow monitoring calibration certification and supporting records
- Ash pond volume certification and supporting records
- Special reports, certifications, etc., required by NPDES permit
- All enforcement actions
- NPDES state or federal inspection reports
- Sewage treatment plant operator certification
- Administrative orders
- Sewer and storm drain layout
- Local sewer use ordinance
- Local service use permit
- Sewer system bypass records
- Notification to local POTW
- Old spill reports
- Repair/Maintenance records for the wastewater treatment system
- As built drawings
- Stormwater pollution prevention plan
- Pretreatment permits
- Design plans for wastewater and industrial waste treatment plants, including treatment basins
- Utility and general site maps, diagrams - plumbing (maintenance shops)

Typical Physical Features To Inspect

- Discharge outfall pipes (maintenance shops, hardstands, and parking lots)
- Wastewater treatment facilities
- Industrial treatment facilities
- Floor and sink drains (especially in industrial areas)
- Oil storage tanks
- Oil/water separators and other pretreatment devices such as sand and grit traps, grease traps, and sand interceptors
- Wastewater generation points
- Discharge to POTW
- Stormwater ditches around motor pools
- Streams, rivers, open waterways
- Stormwater collection points (especially in industrial and maintenance areas)
- Fire training pit
- Nonpoint source discharge areas
- Motor pools and vehicle maintenance stands, plumbing, drains, and discharges (end of pipe)
- Wash racks (centralized facilities, individual and areas in vicinity of maintenance shop)
- Catch basins, drop inlets, holding/retention ponds
- Electrical grease racks and inspection racks
- Waste and sump collection points
- Detention ponds from vehicle washing operations
- Vehicle maintenance inspection pits and ramps
- Sludge disposal areas (especially from vehicle wash racks and central facilities)

- Battery and radiator repair operations
- Sewage sludge land application sites
- Construction sites

List of Acronyms and Abbreviations

ac	acres
ANFO	ammonium nitrate and fuel oil
BAT	best available technology economically achievable
BCT	best conventional pollutant control technology
BOD_5	five-day biochemical oxygen demand
BPT	best practicable control technology currently available
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CFU	colony forming units
cm	centimeter
COD	chemical oxygen demand
CWA	Clean Water Act
DMR	discharge monitoring report
EPA	Environmental Protection Agency
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FR	Federal Register
ft	foot
g	grams
gal	gallon
GRAS	generally recognized as safe
h	hours
ha	hectares
HMX	cyclotetramethylene tetranitramine
hp	horsepower
in.	inch
k cu m	1000 cubic meters
kkg	1000 kilograms
kg	kilogram
kw	kilowatt
kwh	kilowatt hour
L	liter
lb	pounds
m	meter
mg	milligrams
min	minutes
mm	millimeter
mo	months
MP	Management Practice
Mw	megawatt
Mwh	megawatt hour
NCN	nitrocarbonitrate
NOAA	National Oceanic and Atmospheric Administration
NOV	Notice of Violation
NPDES	National Pollutant Discharge Elimination System
NSPS	new source performance standards
OCPSF	organic chemicals, plastics, and synthetic fibers
P2	Pollution Prevention

PAI	pesticide active ingrédients
PL	public law
PFPR	pesticide formulating packaging and repackaging facility
POL	petroleum, oil, and lubricant
POTW	publicly owned treatment works
pound	lb
PSES	pretreatment standards for existing sources
PSNS	pretreatment standards for new sources
QA	quality assurance
RCRA	Resource Conservation and Recovery Act
RDX	cyclotrimethylene trinitramine
s	seconds
SARA	Superfund Amendments and Reauthorization Act
SIC	Standard Industrial Classifications
SPCC	Spill Prevention Control and Countermeasure plan
SOUR	specific oxygen uptake rate
SWDA	Solid Waste Disposal Act
TDS	total dissolved solids
TMDL	total maximum daily load
TNT	trinitrotoluene
TOC	total organic carbon
TRC	technical review committee
TSS	total suspended non-filterable solids
TTO	total toxic organics
TWTDS	treatment works treating domestic sewage
USC	United States Code
WQS	water quality standards
WWTP	wastewater treatment plan
yr	year

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Index for Checklist Users

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Checklist

COMPLIANCE CATEGORY: MUNICIPAL WASTEWATER MANAGEMENT	
REGULATORY REQUIREMENT OR MANAGEMENT PRACTICE	**REVIEWER CHECKS**
MWW.1 **GENERAL**	
MWW.1.1. The current status of any ongoing or unresolved consent orders, compliance agreements, notice of violations (NOVs), inter-agency agreements, or equivalent state enforcement actions is required to be examined.	Determine if noncompliance issues have been resolved by reviewing a copy of the previous report, consent orders, compliance agreements, NOVs, interagency agreements, or equivalent state enforcement actions. (NOTE: For those open items, indicate what corrective action is planned and milestones established to correct problems.)
MWW.1.2. Facilities are required to comply with all applicable federal regulatory requirements not contained in this checklist.	Determine if any new regulations have been issued since the finalization of this document. If so, annotate checklist to include new standards. Determine if the facility has activities or facilities that are regulated, but not addressed in this checklist. Verify that the facility is in compliance with all applicable and newly issued regulations.
MWW.1.3. Facilities are required to comply with state and local regulations concerning wastewater management.	Verify that the facility is complying with state and local requirements. Verify that the facility is operating according to permits issued by the state or local agencies. (NOTE: Issues typically regulated by state and local agencies include: – nonpoint sources – NPDES permits – wastewater – monitoring and recordkeeping for NPDES permitted sources – certification requirements for laboratories analyzing samples – wastewater treatment plant operator certification – sludge disposal – pretreatment standards – discharges to sewage treatment facilities – industrial wastewater – septic tanks

COMPLIANCE CATEGORY: MUNICIPAL WASTEWATER MANAGEMENT	
REGULATORY REQUIREMENT OR MANAGEMENT PRACTICE	**REVIEWER CHECKS**
	– stormwater pollution prevention plan – stormwater discharges.)
MWW.1.4. The location, design, construction and capacity of cooling water intake structures of any point source is required to meet specific parameters (40 CFR 401.14).	Verify that the location, design, construction and capacity of cooling water intake structures of any point source for which a standard is established pursuant to section 301 or 306 of the Act reflects the best technology available for minimizing adverse environmental impact, in accordance with 40 CFR 402.

<table>
<tr><th colspan="2">COMPLIANCE CATEGORY:
MUNICIPAL WASTEWATER MANAGEMENT</th></tr>
<tr><th>REGULATORY REQUIREMENT OR MANAGEMENT PRACTICE</th><th>REVIEWER CHECKS</th></tr>
<tr><td>MWW.10

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMITS</td><td></td></tr>
<tr><td>MWW.10.1. Point source discharges are required to have either a state NPDES, or a federal NPDES permit if located in states without an U.S. EPA approved NPDES permit program (40 CFR 122.1(b), 122.21(c)(2)(i) through 122.21(c)(2)(iv), and 122.41(a)).</td><td>Verify that discharges of pollutants from any point source into waters of the United States have a NPDES permit. 40 CFR 122.1(b)(1)

(NOTE: See definition of Point Source.)

(NOTE: Look for oil/water separators and washracks that discharge directly to the environment.)

Verify that the following additional point sources have NPDES permits for discharges:

– concentrated animal feeding operations
– concentrated aquatic animal production facilities
– discharges into aquaculture projects
– discharges of storm water as required in 40 CFR 122.26
– silvicultural point sources.

<u>Duty to Comply</u>

Verify that all permit requirements are being met such as: 40 CFR 122.41(a)

– monitoring/sampling
– concentrations of discharge constituents
– recordkeeping
– reports.

<u>Scope/Who Covered by NPDES</u>

(NOTE: The NPDES permit program also applies to owners or operators of any treatment works treating domestic sewage, whether or not the treatment works is otherwise required to obtain an NPDES permit, unless all requirements implementing section 405(d) of CWA applicable to the treatment works treating domestic sewage are included in a permit issued under the appropriate provisions of subtitle C of the Solid Waste Disposal Act, Part C of the Safe Drinking Water Act, the Marine Protection, Research, and Sanctuaries Act of 1972, or the Clean Air Act, or under state permit programs approved by the U.S. EPA or authorized regulatory agency as adequate to assure compliance with section 405 of the CWA. In addition, where no 40 CFR 503 standard exists for a facility's use or disposal</td></tr>
</table>

COMPLIANCE CATEGORY: MUNICIPAL WASTEWATER MANAGEMENT	
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	practice, the owner/operator of the facility is not automatically required to submit a permit application (64 FR 42437 August 4, 1999). For example, industrial treatment works that treat domestic sewage along with process wastes are not currently addressed under 40 CFR 503 and, therefore, USEPA does not require that they apply for a sewage sludge permit at this time (64 FR 42437).) (NOTE: The U.S. EPA or authorized regulatory agency may designate any person subject to the standards for sewage sludge use and disposal as a "treatment works treating domestic sewage", where they find that a permit is necessary to protect public health and the environment from the adverse effects of sewage sludge or to ensure compliance with the technical standards for sludge use and disposal developed under CWA section 405(d).) Verify that any person designated as a "treatment works treating domestic sewage" submits an application for a permit within 180 days of being notified by the Regional Administrator that a permit is required.
MWW.10.2. Any person who discharges or proposes to discharge pollutants or who owns or operates a "sludge-only facility" and who does not have an effective permit, is required to submit a complete permit application according to a specific schedule (40 CFR 122.21(a) through 122.21(d), 122.21(f) through 122.21(k), and 122.21(p)).	(NOTE: This checklist item does not apply to persons covered by general permits under 40 CFR 122.28, excluded under 40 CFR 122.3 (see the definition for NPDES Permit Exclusions), or a user of a privately owned treatment works unless the Director requires otherwise.) Verify that any person who discharges or proposes to discharge pollutants or who owns or operates a "sludge-only facility" whose sewage sludge use or disposal practice is regulated by 40 CFR 503, and who does not have an effective permit, submits a complete application to the Director according to the following time schedule: – any person proposing a new discharge, at least 180 days before the date on which the discharge is to commence, unless permission for a later date has been granted by the Director – construction activity that results in the disturbance of less than 5 acres of total land area which is not part of a larger common plan of development or sale, at least 90 days before the date on which construction is to commence – any existing "treatment works treating domestic sewage" required to have, or requesting site-specific pollutant limits as provided in 40 CFR 503, within 180 days after publication of a standard applicable to its sewage sludge use or disposal practices <u>Sewage Sludge</u> – for a permit under section 405(f) of the CWA, a TWTDS whose sewage sludge use or disposal practices are regulated by 40 CFR 503 with a currently effective NPDES permit, at the time of its next NPDES permit renewal application – for a permit under section 405(f) of the CWA, any other TWTDS whose

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	sewage sludge use or disposal practices are regulated by 40 CFR 503, within 1 yr after publication of a standard applicable to its sewage sludge use or disposal practice – for a permit under section 405(f) of the CWA, any TWTDS whose sewage sludge use or disposal practices are regulated by 40 CFR 503 that commences operations after promulgation of an applicable ``standard for sewage sludge use or disposal," at least 180 days prior to the date proposed for commencing operations. (NOTE: The Director may require permit applications from any TWTDS at any time if the Director determines that a permit is necessary to protect public health and the environment from any potential adverse effects that may occur from toxic pollutants in sewage sludge.) (NOTE: See the document titled *Protocol for Conducting Environmental Compliance Audits under the Storm Water Program* for checklist items for permit requirements related to storm water.) <u>Permit Applications</u> Verify that the application is submitted on a U.S. EPA permit application form and contains accurate information (see the text of 40 CFR 122.21(f) through 122.21(k) for a detailed description of the content requirements, including Appendix J to 40 CFR Part 122 - NPDES Testing Requirements for Publicly Owned Treatment Works). Verify that records of all data used to complete permit applications and any supplemental information submitted are retained for a period of at least 3 yr from the date the application is signed. (NOTE: When a facility or activity is owned by one person but is operated by another person, it is the operator's duty to obtain a permit.) (NOTE: The Director may require permit applications from any "treatment works treating domestic sewage" at any time if the Director determines that a permit is necessary to protect public health and the environment from any potential adverse effects that may occur from toxic pollutants in sewage sludge.) <u>Reapplication for Permit</u> Verify that any POTW with a currently effective permit submits a new application at least 180 days before the expiration date of the existing permit, unless permission for a later date has been granted by the Director. Verify that all other permittees with currently effective permits submit a new application 180 days before the existing permit expires, except that the U.S. EPA

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	or authorized regulatory agency may grant permission to submit an application later than the deadline for submission otherwise applicable, but no later than the permit expiration date.
MWW.10.3. Certain discharges of storm water are required to be permitted (40 CFR 122.26(a), 122.26(c), 122.26(d), 122.26(g)(1) and 122.41(a)).	<u>Municipal Separate Storm Sewer</u> Verify that the municipality has obtained permits for all discharges from large, medium, or small municipal separate storm sewer systems as required by U.S. EPA Storm Water Program. (NOTE: For specific requirements and audit checklist items, refer to U.S. EPA's *Protocol for Conducting Environmental Compliance Audits under the Storm Water Program*.)
MWW.10.4. Conveyances that discharge storm water runoff combined with municipal sewage are point sources and must obtain NPDES permits in accordance with (40 CFR 122.21)	<u>Combined Sewer System</u> (NOTE: Municipal Combined Sewer Systems are required to implement BAT/BCT as defined in the U.S. EPA. *Combined Sewer Overflow (CSO) Control Policy*. 56 Federal Register No. 75. Pages 18688 - 18696. 4/19/94.) Verify whether the facility has a combined sewer system (CSS). Verify whether the facility has implemented BAT/BCT. (NOTE: At a minimum BAT/BCT consists of the nine minimum controls listed below: – proper operation and regular maintenance programs for the sewer system and the CSOs – maximum use of the collection system for storage – review and modification of pretreatment requirements to assure CSO impacts are minimized – maximization of flow to the publicly owned treatment works (POTW) for treatment – prohibition of CSOs during dry weather – control of solid and floatable materials in CSOs – pollution prevention – public notification of CSO occurrences and impacts – monitoring to effectively characterize CSO impacts and the efficacy of CSO controls.) (NOTE: CSOs are not subject to secondary treatment requirements applicable to POTWs.)

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	Verify the facility met the January 1, 1997 deadline for implementing the nine minimum controls. Verify the facility submitted the appropriate documentation to the permitting authority showing the implementation of these controls. <u>Long Term CSO Plan</u> Verify that the facility has a long-term CSO plan approved by the permitting authority. Verify that any requirements/schedules in the NPDES/SPDES permit for implementation of the long-term CSO control plan.
MWW.10.5. All holders of NPDES permits are required to meet certain management and operational requirements (40 CFR 122.41(b) through 122.41(n)).	Verify that, if the permittee wishes to continue an activity regulated by a permit after the expiration date of the permit, the permittee applied for and obtained a new permit. (NOTE: It is not a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.) Verify that the permittee takes all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of the permit that has a reasonable likelihood of adversely affecting human health or the environment. Verify that the permittee at all times properly operates and maintains all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of the permit. (NOTE: Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This requires the operation of back-up or auxiliary facilities or similar systems that are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.) <u>Modification, Revocation, Reissuance, or Termination</u> (NOTE: A permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition. A permit does not convey any property rights of any sort, or any exclusive privilege.)

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	Verify that the permittee provides to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. Verify that the permittee also provides to the Director, upon request, copies of records required to be kept by this permit. <u>Monitoring</u> Verify that samples and measurements taken for the purpose of monitoring are representative of the monitored activity. Verify that the permittee retains records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by the permit, and records of all data used to complete the application for the permit, for a period of at least 3 yr from the date of the sample, measurement, report or application. Verify that records of monitoring information required by the permit related to the permittee's sewage sludge use and disposal activities are retained for a period of at least 5 yr (or longer as required by 40 CFR 503). (NOTE: The retention period may be extended by request of the Director at any time.) Verify that records of monitoring information include: – the date, exact place, and time of sampling or measurements – the individual(s) who performed the sampling or measurements – the date(s) analyses were performed – the individual(s) who performed the analyses – the analytical techniques or methods used – the results of such analyses. Verify that monitoring results are conducted according to test procedures approved under 40 CFR 136 or, in the case of sludge use or disposal, approved under 40 CFR 136 unless otherwise specified in 40 CFR 503, unless other test procedures have been specified in the permit. Verify that all applications, reports, or information submitted to the Director are signed and certified as required in 40 CFR 122.22. Verify that monitoring results are reported at the intervals specified in the permit and are reported on a Discharge Monitoring Report (DMR) or forms provided or

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	specified by the Director for reporting results of monitoring of sludge use or disposal practices. Verify that, if the permittee monitors any pollutant more frequently than required by the permit using approved test procedures, or as specified in the permit, the results of this monitoring are included in the calculation and reporting of the data submitted in the DMR or sludge reporting form specified by the Director. (NOTE: Calculations for all limitations that require averaging of measurements shall utilize an arithmetic mean unless otherwise specified by the Director in the permit.) <u>Notice of Planned Alterations or Additions</u> Verify that the permittee gives notice to the Director as soon as possible of any planned physical alterations or additions to the permitted facility. (NOTE: Notice is required only when: – the alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source – the alteration or addition could significantly change the nature or increase the quantity of pollutants discharged (This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements under 40 CFR 122.42(a)(1)) – the alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan.) <u>Notice of Permit Transfer</u> Verify that the permittee gives notice to the Director of any planned changes in the permitted facility or activity that may result in noncompliance with permit requirements. (NOTE: The permit is not transferable to any person except after notice to the Director. The Director may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under the Clean Water Act (see 40 CFR 122.61; in some cases, modification or revocation and reissuance is mandatory.)

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	Other Reports Verify that reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of the permit are submitted no later than 14 days following each schedule date. Certain Reports of Noncompliance Verify that the permittee reports any noncompliance which may endanger health or the environment such that: – information is provided orally within 24 h from the time the permittee became aware of the circumstances – a written submission is provided within 5 days of the time the permittee becomes aware of the circumstances and contains a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance. Verify that the following is included as a part of information which must be reported within 24 h: – any unanticipated bypass which exceeds any effluent limitation in the permit – any upset which exceeds any effluent limitation in the permit – violation of a maximum daily discharge limitation for any of the pollutants listed by the Director in the permit to be reported within 24 h. (NOTE: The Director may waive the written report on a case-by-case basis if the oral report has been received within 24 h.) Verify that the permittee reports all instances of noncompliance that are not otherwise reported, at the time monitoring reports are submitted. Verify that where the permittee has become aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Director, it promptly submits such facts or information. Verify that the permittee only allows a bypass to occur which does not cause effluent limitations to be exceeded, if it is for essential maintenance to assure efficient operation. Verify that, if the permittee knows in advance of the need for a bypass, it submits prior notice, if possible, at least 10 days before the date of the bypass.

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	Verify that the permittee submits notice of an unanticipated bypass within 24 h. (NOTE: Bypass is prohibited, and the Director may take enforcement action against a permittee for bypass, unless: – bypass was unavoidable to prevent loss of life, personal injury, or severe property damage – there were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime (This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance.) – the permittee submitted notices as required. Verify that, if a permittee wishes to establish an affirmative defense of upset, they demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that: – an upset occurred and that the permittee can identify the cause(s) of the upset – the permitted facility was at the time being properly operated – the permittee submitted required 24 h notice of the upset – the permittee complied with any remedial measures required.
MWW.10.6. All POTWs are required to meet additional conditions (40 CFR 122.42(b)).	Verify that all POTWs provide adequate notice to the Director of the following: – any new introduction of pollutants into the POTW from an indirect discharger which would be subject to section 301 or 306 of CWA if the POTW were directly discharging those pollutants – any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit. (NOTE: Adequate notice shall include information on: – the quality and quantity of effluent introduced into the POTW – any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.)

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MWW.10.7. Municipal separate storm sewer systems are required to meet additional conditions (40 CFR 122.42(c)).	Verify that the operator of a large or medium municipal separate storm sewer system or a municipal separate storm sewer that has been designated by the Director submits an annual report by the anniversary of the date of the issuance of the permit for the system. Verify that the report includes: – the status of implementing the components of the storm water management program that are established as permit conditions – proposed changes to the storm water management programs that are established as permit conditions – revisions, if necessary, to the assessment of controls and the fiscal analysis reported in the permit application – a summary of data, including monitoring data, that is accumulated throughout the reporting year – annual expenditures and budget for year following each annual report – a summary describing the number and nature of enforcement actions, inspections, and public education programs – identification of water quality improvements or degradation.
MWW.10.8. Transfer of permits may only occur under certain conditions (40 CFR 122.61 and 122.63).	Verify that a permit is transferred by the permittee to a new owner or operator only if the permit has been modified or revoked and reissued, or a minor modification made, to identify the new permittee and incorporate such other requirements as may be necessary under CWA. (NOTE: As an alternative, any NPDES permit may be automatically transferred to a new permittee if: – the current permittee notifies the Director at least 30 days in advance of the proposed transfer date – the notice includes a written agreement between the existing and new permittees containing a specific date for transfer of permit responsibility, coverage, and liability between them – the Director does not notify the existing permittee and the proposed new permittee of his or her intent to modify or revoke and reissue the permit.) (NOTE: A modification may also be a minor modification under 40 CFR 122.63. If this notice is not received, the transfer is effective on the date specified in the agreement.) (NOTE: Under 40 CFR 122.63, minor modifications may only: – correct typographical errors – require more frequent monitoring or reporting by the permittee – change an interim compliance date in a schedule of compliance, provided the

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	new date is not more than 120 days after the date specified in the existing permit and does not interfere with attainment of the final compliance date requirement – allow for a change in ownership or operational control of a facility where the Director determines that no other change in the permit is necessary, provided that a written agreement containing a specific date for transfer of permit responsibility, coverage, and liability between the current and new permittees has been submitted to the Director – change the construction schedule for a discharger which is a new source without affecting a discharger's obligation to have all pollution control equipment installed and in operation prior to discharge – delete a point source outfall when the discharge from that outfall is terminated and does not result in discharge of pollutants from other outfalls except in accordance with permit limits – incorporate conditions of a POTW pretreatment program that has been approved in accordance with the procedures in 40 CFR 403.11 (or a modification thereto that has been approved in accordance with the procedures in 40 CFR 403.18) as enforceable conditions of the POTW's permits.)

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MWW.30 **PRETREATMENT PROGRAMS**	(NOTE: General Pretreatment regulations (40 CFR 403) apply to the following (40 CFR 403.1(b)): – pollutants from non-domestic sources covered by pretreatment standards which are indirectly discharged into or transported by truck or rail or otherwise introduced into POTWs – POTWs which receive wastewater from sources subject to National pretreatment standards – states which have or are applying for NPDES) programs approved in accordance with section 402 of the CWA – any new or existing source subject to pretreatment standards.) (NOTE: National pretreatment standards do not apply to sources which discharge to a sewer that is not connected to a POTW Treatment Plant.)
MWW.30.1. POTWs are required to develop specific limits to ensure compliance with 40 CFR 403.5(a) and 403.5(b) (40 CFR 403.5(c) and 403.8(f)(4)).	Verify that when the POTW has an approved Pretreatment Program, it develops and enforces specific limits to implement and enforce the prohibitions listed in 40 CFR 403.5(a)(1) and (b) (see checklist item MWW.20.1). (NOTE: Each POTW with an approved pretreatment program shall continue to develop these limits as necessary and effectively enforce such limits.) Verify that all other POTW's, in cases where pollutants contributed by industrial user(s) result in interference or pass-through, and the violation is likely to recur, develop and enforce specific effluent limits for industrial user(s), and all other users, as appropriate, which, together with appropriate changes in the POTW's facilities or operation, ensure renewed and continued compliance with the POTW's NPDES permit or sludge use or disposal practices. (NOTE: Specific effluent limits shall not be developed and enforced without individual notice to persons or groups who have requested such notice and an opportunity to respond.) Verify that, if the POTW has not developed local limits as required, the POTW has demonstrated the limits are not necessary.
MWW.30.2. In certain circumstances, POTWs are required to develop a POTW pretreatment program which meets specific criteria (40 CFR 403.8(a), 403.8(f)(2)).	Verify that any POTW (or combination of POTWs operated by the same authority) with a total design flow greater than 5 million gallons per day (mgd) and receiving from industrial users pollutants which pass through or interfere with the operation of the POTW, or are otherwise subject to pretreatment standards has a POTW pretreatment program. (NOTE: The pretreatment program is not required if the NPDES state exercises its option to assume local responsibilities.)

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	(NOTE: The U.S. EPA or authorized regulatory agency may require that a POTW with a design flow of 5 mgd or less develop a POTW pretreatment program if the nature or volume of the industrial influent, treatment process upsets, violations of POTW effluent limitations, contamination of municipal sludge, or other circumstances warrant, in order to prevent interference with the POTW or pass through.) Verify that the POTW pretreatment program includes procedure which enables the POTW to: – identify and locate all possible industrial users which might be subject to the POTW pretreatment program – identify the character and volume of pollutants contributed to the POTW by the identified industrial users – notify identified industrial users of applicable pretreatment standards and any applicable requirements under sections 204(b) and 405 of the CWA and subtitles C and D of RCRA – receive and analyze self-monitoring reports and other notices submitted by industrial users in accordance with the self-monitoring requirements – randomly sample and analyze the effluent from industrial users and conduct surveillance activities in order to identify, independent of information supplied by industrial users, occasional and continuing noncompliance with pretreatment standards – inspect and sample the effluent from each significant industrial user at least once a year – evaluate, at least once every 2 yr, whether each significant industrial user needs a plan to control slug discharges – investigate instances of noncompliance with pretreatment standards and Requirements, as indicated in the required reports and notices, or indicated by analysis, inspection, and surveillance activities – perform sample taking and analysis and the collection of other information with sufficient care to produce evidence admissible in enforcement proceedings or in judicial actions – comply with the public participation requirements of 40 CFR 25 in the enforcement of national pretreatment standards. Verify that the procedures include provisions for at least annual public notification in the largest daily newspaper published in the municipality in which the POTW is located, of industrial users which, at any time during the previous 12 mo, were in significant noncompliance with applicable pretreatment requirements. (NOTE: An industrial user is in significant noncompliance if its violation meets one or more of the following criteria: – chronic violations of wastewater discharge limits, defined here as those in which 66 percent or more of all of the measurements taken during a 6-mo

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<tr><th>REGULATORY REQUIREMENT OR MANAGEMENT PRACTICE</th><th>REVIEWER CHECKS</th></tr>
<tr><td></td><td>period exceed (by any magnitude) the daily maximum limit or the average limit for the same pollutant parameter
– Technical Review Criteria (TRC) violations, defined as those in which 33 percent or more of all of the measurements for each pollutant parameter taken during a 6-mo period equal or exceed the product of the daily maximum limit or the average limit multiplied by the applicable TRC (TRC=1.4 for BOD, TSS, fats, oil, and grease, and 1.2 for all other pollutants except pH)
– any other violation of a pretreatment effluent limit (daily maximum or longer-term average) that the Control Authority determines has caused, alone or in combination with other discharges, interference or pass through (including endangering the health of POTW personnel or the general public)
– any discharge of a pollutant that has caused imminent endangerment to human health, welfare or to the environment or has resulted in the POTW's exercise of its emergency authority to halt or prevent such a discharge
– failure to meet, within 90 days after the schedule date, a compliance schedule milestone contained in a local control mechanism or enforcement order for starting construction, completing construction, or attaining final compliance
– failure to provide, within 30 days after the due date, required reports such as baseline monitoring reports, 90-day compliance reports, periodic self-monitoring reports, and reports on compliance with compliance schedules
– failure to accurately report noncompliance
– any other violation or group of violations which the Control Authority determines will adversely affect the operation or implementation of the local pretreatment program.)</td></tr>
<tr><td>MWW.30.3. A POTW requesting approval of a POTW pretreatment program is required to develop a program description and follow certain procedures (40 CFR 403.9(a) through 403.9(c), 403.9(e), and 403.9(g)).</td><td>Verify that the program description is submitted to the Approval Authority that will make a determination on the request for program approval.

Verify that a POTW requesting approval of a POTW pretreatment program develops a program description which contains the following information:

– a statement from the City Solicitor or a city official acting in a comparable capacity (or the attorney for those POTWs which have independent legal counsel) that the POTW has authority adequate to carry out the programs described in 40 CFR 403.8. This statement shall:
    – identify the provision of the legal authority under 40 CFR 403.8(f)(1) which provides the basis for each procedure under 40 CFR 403.8(f)(2)
    – identify the manner in which the POTW will implement the program requirements set forth in 40 CFR 403.8, including the means by which pretreatment standards will be applied to individual industrial users (e.g., by order, permit, ordinance, etc.)
    – identify how the POTW intends to ensure compliance with pretreatment standards and requirements, and to enforce them in the event of noncompliance by industrial users</td></tr>
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	– a copy of any statutes, ordinances, regulations, agreements, or other authorities relied upon by the POTW for its administration of the Program, including a statement reflecting the endorsement or approval of the local boards or bodies responsible for supervising and/or funding the POTW Pretreatment Program if approved – a brief description (including organization charts) of the POTW organization which will administer the Pretreatment Program. If more than one agency is responsible for administration of the Program the responsible agencies should be identified, their respective responsibilities delineated, and their procedures for coordination set forth – a description of the funding levels and full- and part-time manpower available to implement the Program. (NOTE: The POTW may request conditional approval of the pretreatment program pending the acquisition of funding and personnel for certain elements of the program. The request for conditional approval must meet the requirements set forth for the program description except that the requirements may be relaxed if the submission demonstrates that: – a limited aspect of the Program does not need to be implemented immediately – the POTW had adequate legal authority and procedures to carry out those aspects of the program which will not be implemented immediately – funding and personnel for the program aspects to be implemented at a later date will be available when needed. The POTW will describe in the submission the mechanism by which this funding will be acquired. Upon receipt of a request for conditional approval, the Approval Authority will establish a fixed date for the acquisition of the needed funding and personnel. If funding is not acquired by this date, the conditional approval of the POTW Pretreatment Program and any removal allowances granted to the POTW, may be modified or withdrawn.) Verify that any POTW requesting POTW pretreatment program approval submits to the Approval Authority three copies of the submission. Verify that the POTW pretreatment program is consistent with any approved water quality management plan developed in accordance with 40 CFR 130, 131, as revised, where such 208 plan includes Management Agency designations and addresses pretreatment in a manner consistent with 40 CFR 403.

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MWW.30.4. POTWs are required to have sufficient resources a qualified personnel to carry out the POTW pretreatment program (40 CFR 403.8(f)(3)).	Verify that the POTW has sufficient resources and qualified personnel to carry out the Pretreatment Program authorities and procedures. (NOTE: In some limited circumstances, funding and personnel may be delayed where: – the POTW has adequate legal authority and procedures to carry out the pretreatment program requirements – a limited aspect of the Program does not need to be implemented immediately.)
MWW.30.5. POTWs are required to develop and implement an enforcement response plan (40 CFR 403.8(f)(5)).	Verify that the POTW develops and implements an enforcement response plan that contains detailed procedures indicating how a POTW will investigate and respond to instances of industrial user noncompliance. Verify that the plan, at a minimum: – describes how the POTW will investigate instances of noncompliance – describes the types of escalating enforcement responses the POTW will take in response to all anticipated types of industrial user violations and the time periods within which responses will take place – identifies (by title) the official(s) responsible for each type of response – adequately reflects the POTW's primary responsibility to enforce all applicable pretreatment requirements and standards.
MWW.30.6. POTWs are required to prepare and maintain a list of significant industrial users (40 CFR 403.8(f)(6)).	Verify that the POTW maintains a list of significant industrial users (40 CFR 403.3(t)) and the criteria applicable to each industrial user. Verify that the list indicates whether the POTW has made a determination that the industrial user should not be considered a significant industrial user. Verify that the list, plus any modifications, is submitted to the Approval Authority.
MWW.30.7. POTWs with approved Pretreatment Programs are required to provide the Approval Authority with a report containing certain information (40 CFR 403.12(i)).	Verify that POTWs with approved Pretreatment Programs provide the Approval Authority with a report that briefly describes the POTW's program activities, including activities of all participating agencies, if more than one jurisdiction is involved in the local program. Verify that the required report is submitted no later than 1 yr after approval of the POTW's Pretreatment Program, and at least annually thereafter. Verify that the report includes, at a minimum, the following: – an updated list of the POTW's industrial users, including their names and

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	addresses, or a list of deletions and additions keyed to a previously submitted list, including: – a brief explanation of each deletion – which Industrial Users are subject to categorical pretreatment Standards and specify which Standards are applicable to each Industrial User – which Industrial Users are subject to local standards that are more stringent than the categorical Pretreatment Standards – the Industrial Users that are subject only to local Requirements – a summary of the status of Industrial User compliance over the reporting period – a summary of compliance and enforcement activities (including inspections) conducted by the POTW during the reporting period – a summary of changes to the POTW's pretreatment program that have not been previously reported to the Approval Authority – any other relevant information requested by the Approval Authority.
MWW.30.8. POTWs are required to keep specific reports (40 CFR 403.12(o)).	Verify that records are kept of all information resulting from monitoring activities. Verify that the records include for all samples the following information: – the date, exact place, methods, and time of sampling and the names of the person or persons taking the samples – the dates analyses were performed – who performed analyses – the analytical techniques, methods used – the results of the analyses. Verify that records are kept for 3 yr. and are signed and certified by the equivalent of a responsible corporate officer.
MWW.30.9. POTWs which are required to collect whole effluent toxicity (WET) data must meet specific requirements (40 CFR 122.21(j)).	(NOTE: Many new and existing POTWs (with approved pretreatment programs or meeting certain other criteria) are required to collect WET data for submission to the permitting authority at time of application or re-application for an NPDES permit.) Verify that the following POTWs provide the results of valid whole effluent biological toxicity testing to the Director: – all POTWs with design influent flows equal to or greater than one million gallons per day – all POTWs with approved pretreatment programs or POTWs required to develop a pretreatment program

<table>
<tr><th colspan="2">COMPLIANCE CATEGORY:
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<tr><th>REGULATORY REQUIREMENT OR MANAGEMENT PRACTICE</th><th>REVIEWER CHECKS</th></tr>
<tr><td></td><td>(NOTE: In addition to the POTWs listed above, the Director may require other POTWs to submit the results of toxicity tests with their permit applications, based on consideration of the following factors:
– the variability of the pollutants or pollutant parameters in the POTW effluent (based on chemical-specific information, the type of treatment facility, and types of industrial contributors)
– the dilution of the effluent in the receiving water (ratio of effluent flow to receiving stream flow)
– existing controls on point or nonpoint sources, including total maximum daily load calculations for the waterbody segment and the relative contribution of the POTW
– receiving stream characteristics, including possible or known water quality impairment, and whether the POTW discharges to a coastal water, one of the Great Lakes, or a water designated as an outstanding natural resource
– other considerations (including but not limited to the history of toxic impact and compliance problems at the POTW), which the Director determines could cause or contribute to adverse water quality impacts.)

Verify that POTWs required to conduct toxicity testing use U.S. EPA's methods or other established protocols that are scientifically defensible and sufficiently sensitive to detect aquatic toxicity.

Verify that testing has been conducted since the last NPDES permit reissuance or permit modification under 40 CFR 122.62(a), whichever occurred later.

Verify that all POTWs with approved pretreatment programs provide a written technical evaluation of the need to revise local limits under 40 CFR 403.5(c)(1) to the Director.</td></tr>
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USE OR DISPOSAL OF SEWAGE SLUDGE **MWW.100** **General**	(NOTE: These general requirements apply to the final use and disposal of sewage sludge generated during the treatment of domestic sewage in a treatment works. For exclusions see the definition of the term *Exempted Sewage Sludge* (40 CFR 503.1(a)).)
MWW.100.1. Representative samples of sewage sludge applied to the land, placed on a surface disposal site, or fired in a sewage sludge incinerator are required to be collected and analyzed (40 CFR 503.8).	Determine if sewage sludge is applied to the land, placed on a surface disposal site, or fired in a sewage sludge incinerator. Verify that the sewage sludge (see definitions of *Class A Sewage Sludge* and *Class B Sewage Sludge* in this document) is analyzed prior to application, placement, or firing for the following according to the methodologies outlined in 40 CFR 503.8(b): – enteric viruses – fecal coliforms – helminth ova – inorganic pollutants – salmonella bacteria – SOUR – total, fixed, and volatile solids.
MWW.100.2. Holders of sludge management permits are required to meet certain conditions (40 CFR 501.15(b)(1), 501.15(b)(2), 501.15(b)(4) through 501.15(b)(8), 501.15(b)(10) through 501.15(b)(14)).	Verify that the permittee complies with all conditions of this permit. (NOTE: Any noncompliance with 40 CFR Part 503 constitutes a violation of the Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application. Verify that the permittee complies with standards for sewage sludge use or disposal established under 40 CFR 503) within the time provided in the regulations that establish such standards even if this permit has not yet been modified to incorporate the standards. (NOTE: It is not a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.) Verify that the permittee takes all reasonable steps to minimize or prevent sludge use or disposal in violation of the permit that has a reasonable likelihood of adversely affecting human health or the environment.

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	Verify that the permittee all times properly operates and maintains all facilities and systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with the conditions of the permit. (NOTE: Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures.) Verify that back-up or auxiliary facilities or similar systems that are installed by a permittee are only operated when the operation is necessary to achieve compliance with the conditions of the permit. (NOTE: This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition. Verify that the permittee furnishes to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. Verify that the permittee also furnishes to the Director, upon request, copies of records required to be kept by this permit. Verify that the permittee monitors and reports monitoring results as specified in the permit with a frequency dependent on the nature and effect of its sludge use or disposal practices. (NOTE: At a minimum, this will be as required by 40 CFR 503.) Verify that samples and measurements taken for the purpose of monitoring are representative of the monitored activity. Verify that the permittee retains records of all monitoring information, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 5 yr from the date of the sample, measurement, report or application, or longer as required by 40 CFR 503. (NOTE: This period for retention of records may be extended by request of the Director at any time.) Verify that records of monitoring information include: – the date, exact place, and time of sampling or measurements – the individuals who performed the sampling or measurements – the dates analyses were performed

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	– the individuals who performed the analyses – the analytical techniques or methods used; – the results of such analyses. Verify that monitoring is conducted according to test procedures specified in 40 CFR 503 or 136 unless other test procedures have been specified in this permit. Verify that all applications, reports, or information submitted to the Director shall be signed and certified according to the provisions of 40 CFR 122.22. Verify that the permittee gives notice to the Director as soon as possible of any planned physical alterations or additions to the permitted facility, or significant changes planned in the permittee's sludge disposal practice, where such alterations, additions, or changes may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan. Verify that the permittee gives advance notice to the Director of any planned changes in the permitted facility or activity that may result in noncompliance with permit requirements. (NOTE: This permit is not transferable to any person except after notice to the Director. The Director may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under the CWA.) Verify that the permittee reports all instances of noncompliance and the reports of noncompliance are submitted with the permittee's next self monitoring report or earlier, if requested by the Director or if required by an applicable standard for sewage sludge use or disposal or condition of this permit. Verify that, where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Director, it promptly submits such facts or information. (NOTE: If a standard for sewage sludge use or disposal applicable to permittee's use or disposal methods is promulgated before the expiration of this permit, and that standard is more stringent than the sludge pollutant limits or acceptable management practices authorized in this permit, or controls a pollutant or practice not limited in this permit, this permit may be promptly modified or revoked and reissued to conform to the new standard for sludge use or disposal. Verify that, if the permittee wishes to continue an activity regulated by the permit after the expiration date of this permit, the permittee applies for a new permit.

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USE OR DISPOSAL OF SEWAGE SLUDGE **MWW.120** **Land Application - General**	(NOTE: These general requirements apply to the final use and disposal of sewage sludge generated during the treatment of domestic sewage in a treatment works. For exclusions see the definition of the term *Exempted Sewage Sludge* (40 CFR 503.1(a)).) (NOTE: The requirements for land application of sewage sludge apply to any person who prepares sewage sludge that is applied to the land, to any person who applies sewage sludge to the land, to sewage sludge applied to the land, and to the land on which sewage sludge is applied (40 CFR 503.10(a)).) (NOTE: These requirements for land application do not apply when one or both of the following meets the pollutant concentrations in Table 1 of Appendix B of this document, the Class A pathogen requirements (see definition for *Class A Sewage Sludge* in this document), and one of the eight processing options for meeting the vector attraction reduction requirements (see definition for *Vector Attraction Reduction Options* in this document): – when a bulk material derived from sewage sludge is applied to the land – when a material derived from sewage sludge is sold or given away in a bag or other container for application to the land (40 CFR 503.10(d), and 503.10(g)).)
MWW.120.1. The land application of sewage sludge must meet certain general requirements (40 CFR 503.10(b), 503.10(c), 503.10(e), 503.10(f), and 503.12(a) through 503.12(c), 503.12(e), 503.12(h), and 503.12(j)).	(NOTE: These requirements do not apply when the following meets the pollutant concentrations in Table 1 of Appendix B of this document, the Class A pathogen requirements (see definition for *Class A Sewage Sludge* in this document), and one of the eight processing options for meeting the vector attraction reduction requirements (see definition for *Vector Attraction Reduction Options* in this document): – when bulk sewage sludge is applied to the land – when a bulk material derived from sewage sludge is applied to the land – when sewage sludge is sold or given away in a bag or other container for application to the land – when a material derived from sewage sludge is sold or given away in a bag or other container for application to the land.) Verify that no person applies bulk sewage sludge subject to the cumulative pollutant loading rates in 40 CFR 503.13(b)(2) (see Table 2 of Appendix B of this document) to agricultural land, forest, a public contact site, or a reclamation site if any of the cumulative pollutant loading rates has been reached. Verify that no person applies domestic septage to agricultural land, forest, or a reclamation site during a 365 day period if the annual application rate in 40 CFR 503.13(c) (see checklist item MWW.120.3) has been reached during that period.

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	Verify that the person who applies sewage sludge to the land obtains the information needed to comply with the requirements in 40 CFR 503, Subpart B: Land Application. Verify that before bulk sewage sludge subject to the cumulative pollutant loading rates in Table 2 of Appendix B of this document is applied to the land, the person who proposes to apply the bulk sewage sludge contacts the permitting authority for the state in which the bulk sewage sludge will be applied to determine whether bulk sewage sludge subject to the cumulative pollutant loading rates in Table 2 of Appendix 3 has been applied to the site since July 20, 1993. (NOTE: If bulk sewage sludge subject to the cumulative pollutant loading rates in Table 2, Appendix B of this document has not been applied to the site since July 20, 1993, the cumulative amount for each pollutant listed in Table 2, Appendix B of this document may be applied to agricultural land, a forest, a public contact site, or a reclamation site.) Verify that, if bulk sewage sludge subject to the cumulative pollutant loading rates in Table 2, Appendix B of this document has been applied to the site since July 20, 1993, and the cumulative amount of each pollutant applied to the site in the bulk sewage sludge since that date is known, the cumulative amount of each pollutant applied to the site is used to determine the additional amount of each pollutant that can be applied to agricultural land, a forest, a public contact site, or a reclamation site. Verify that, if bulk sewage sludge subject to the cumulative pollutant loading rates in Table 2, Appendix B of this document has been applied to the site since July 20, 1993, and the cumulative amount of each pollutant applied to the site in the bulk sewage sludge since that date is not known, an additional amount of each pollutant is not applied to the agricultural land, a forest, a public contact site, or a reclamation site. Verify that the person who applies bulk sewage sludge to the land provides the owner or lease holder of the land on which the bulk sewage sludge is applied notice and necessary information to comply with the requirements in Subpart B of 40 CFR 503. Verify that any person who applies bulk sewage sludge subject to the cumulative pollutant loading rates in Table 2 of Appendix B of this document to the land provides written notice, prior to the initial application of bulk sewage sludge to a land application site by the applier, to the permitting authority for the state in which the bulk sewage sludge will be applied and the permitting authority shall retain and provide access to the notice. Verify that the notice includes:

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	– the location, by either street address or latitude and longitude, of the land application site – the name, address, telephone number, and NPDES permit number (if appropriate) of the person who will apply the bulk sewage sludge. (NOTE: The U.S. EPA or authorized regulatory agency, in the case of a state with an approved sludge management program, may apply any or all of these requirements to the bulk sewage sludge or to bulk material derived from sewage sludge on a case-by-case basis after determining that the general requirements are needed to protect public health and the environment from any reasonably anticipated adverse effect that may occur from any pollutant in the bulk sewage sludge or the bulk material derived from sewage sludge.)
MWW.120.2. Preparers of sewage sludge for land application are required to meet general requirements (40 CFR 503.10(b), 503.10(c), 503.10(e), 503.10(f), and 503.12(d), 503.12(f), 503.12(g), and 503.12(i)).	(NOTE: These requirements do not apply when the following meets the pollutant concentrations in Table 1 of Appendix B of this document, the Class A pathogen requirements (see definition for *Class A Sewage Sludge* in this document), and one of the eight processing options for meeting the vector attraction reduction requirements (see definition for *Vector Attraction Reduction Options* in this document): – when bulk sewage sludge is applied to the land – when a bulk material derived from sewage sludge is applied to the land – when sewage sludge is sold or given away in a bag or other container for application to the land – when a material derived from sewage sludge is sold or given away in a bag or other container for application to the land.) Verify that the person who prepares bulk sewage sludge that is applied to agricultural land, forest, a public contact site, or a reclamation site provides the person who applies the bulk sewage sludge written notification of the concentration of total nitrogen (as N on a dry weight basis) in the bulk sewage sludge. Verify that when a person who prepares bulk sewage sludge provides the bulk sewage sludge to a person who applies the bulk sewage sludge to the land, the person who prepares the bulk sewage sludge provides the person who applies the sewage sludge notice and necessary information to comply with the requirements in Subpart B of 40 CFR 503. Verify that when a person who prepares sewage sludge provides the sewage sludge to another person who prepares the sewage sludge, the person who provides the sewage sludge provides the person who receives the sewage sludge notice and necessary information to comply with the requirements in Subpart B of 40 CFR 503.

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	Verify that any person who prepares bulk sewage sludge that is applied to land in a state other than the state in which the bulk sewage sludge is prepared provides written notice, prior to the initial application of bulk sewage sludge to the land application site by the applier, to the permitting authority for the state in which the bulk sewage sludge is proposed to be applied. Verify that the notice includes: – the location, by either street address or latitude and longitude, of each land application site – the approximate time period bulk sewage sludge will be applied to the site – the name, address, telephone number, and NPDES permit number (if appropriate) for the person who prepares the bulk sewage sludge – the name, address, telephone number, and NPDES permit number (if appropriate) for the person who will apply the bulk sewage sludge. (NOTE: The U.S. EPA or authorized regulatory agency, in the case of a state with an approved sludge management program, may apply any or all of these requirements to the bulk sewage sludge or to bulk material derived from sewage sludge on a case-by-case basis after determining that the general requirements are needed to protect public health and the environment from any reasonably anticipated adverse effect that may occur from any pollutant in the bulk sewage sludge or the bulk material derived from sewage sludge.)
MWW.120.3. Sewage sludge and domestic septage must meet specific standards according to the type of land application it will be used for (40 CFR 503.13(a) and 503.13(c))	Verify that bulk sewage sludge or sewage sludge sold or given away in a bag or other container shall not be applied to the land if the concentration of any pollutant in the sewage sludge exceeds the ceiling concentration for the pollutant in Table 3 of Appendix B of this document. Verify that, if bulk sewage sludge is applied to agricultural land, forest, a public contact site, or a reclamation site, either: – the cumulative loading rate for each pollutant does not exceed the cumulative pollutant loading rate for the pollutant in Table 2 of Appendix B of this document – the concentration of each pollutant in the sewage sludge does not exceed the concentration for the pollutant in Table 1 of Appendix B of this document. Verify that, if bulk sewage sludge is applied to a lawn or a home garden, the concentration of each pollutant in the sewage sludge does not exceed the concentration for the pollutant in Table 1 of Appendix B of this document. Verify that, if sewage sludge is sold or given away in a bag or other container for application to the land, either:

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	– the concentration of each pollutant in the sewage sludge does not exceed the concentration for the pollutant in Table 1 of Appendix B of this document – the product of the concentration of each pollutant in the sewage sludge and the annual whole sludge application rate for the sewage sludge does not cause the annual pollutant loading rate for the pollutant in Table 4 of Appendix B to be exceeded. (NOTE: The procedure used to determine the annual whole sludge application rate is presented in appendix A of 40 CFR 503.) Verify that the annual application rate for domestic septage applied to agricultural lands, forest or a reclamation site during a 365 day period does not exceed the annual application rate calculated using the following equation: $AAR = \frac{N}{0.0026}$ AAR = annual application rate in gallons per acre per 365-day period N = amount of nitrogen in lb per acre per 365 day period needed by the crop or vegetation grown on the land.
MWW.120.4. Certain management practices are required for the land application of sludge (40 CFR 503.10(b), 503.10(c), 503.10(e), 503.10(f), and 503.14).	(NOTE: These requirements do not apply when the following meets the pollutant concentrations in Table 1 of Appendix B of this document, the Class A pathogen requirements (see definition for *Class A Sewage Sludge* in this document), and one of the eight processing options for meeting the vector attraction reduction requirements (see definition for *Vector Attraction Reduction Options* in this document): – when bulk sewage sludge is applied to the land – when a bulk material derived from sewage sludge is applied to the land – when sewage sludge is sold or given away in a bag or other container for application to the land – when a material derived from sewage sludge is sold or given away in a bag or other container for application to the land.) Verify that bulk sewage sludge is not applied to the land if it is likely to adversely affect a threatened or endangered species listed under section 4 of the *Endangered Species Act* or its designated critical habitat. Verify that bulk sewage sludge is not applied to agricultural land, forest, a public

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	contact site, or a reclamation site that is flooded, frozen, or snow-covered so that the bulk sewage sludge enters a wetland or other waters of the United States, except as provided in a permit issued pursuant to section 402 or 404 of the CWA. Verify that bulk sewage sludge is not applied to agricultural land, forest, or a reclamation site that is 10 m or less from waters of the United States unless otherwise specified by the permitting authority. Verify that bulk sewage sludge is applied to agricultural land, forest, a public contact site, or a reclamation site at a whole sludge application rate that is equal to or less than the agronomic rate for the bulk sewage sludge, unless, in the case of a reclamation site, otherwise specified by the permitting authority. Verify that, either a label is affixed to the bag or other container in which sewage sludge that is sold or given away for application to the land, or an information sheet is provided to the person who receives sewage sludge sold or given away in another container for application to the land. Verify that the label or information sheet contains the following information: – the name and address of the person who prepared the sewage sludge that is sold or given away in a bag or other container for application to the land – a statement that application of the sewage sludge to the land is prohibited except in accordance with the instructions on the label or information sheet – the annual whole sludge application rate for the sewage sludge that does not cause any of the annual pollutant loading rates in Table 4 of Appendix B of this document to be exceeded. (NOTE: The U.S. EPA or authorized regulatory agency, in the case of a state with an approved sludge management program, may apply any or all of these requirements to the bulk sewage sludge or to bulk material derived from sewage sludge on a case-by-case basis after determining that the general requirements are needed to protect public health and the environment from any reasonably anticipated adverse effect that may occur from any pollutant in the bulk sewage sludge or the bulk material derived from sewage sludge.)
MWW.120.5. The land application of sludge is required to meet certain operational practices for pathogen and vector attraction reduction (40 CFR 503.15).	Verify that the Class A pathogen requirements or the Class B pathogen requirements and site restrictions (see definitions of *Class A Sewage Sludge* and *Class B Sewage Sludge* in this document) are met when bulk sewage sludge is applied to agricultural land, forest, a public contact site, or a reclamation site. (NOTE: The site restrictions related to Class B pathogen requirements are: – food crops with harvested parts that touch the sewage sludge/soil mixture and are totally above the land surface will not be harvested for 14 mo after

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	application of sewage sludge
	– food crops with harvested parts below the surface of the land will not be harvested for 20 mo after application of sewage sludge when the sewage sludge remains on the land surface for 4 mo or longer prior to incorporation into the soil
	– food crops with harvested parts below the surface of the land will not be harvested for 38 mo after application of sewage sludge when the sewage sludge remains on the land surface for less than 4 mo prior to incorporation into the soil
	– food crops, feed crops, and fiber crops will not be harvested for 30 days after application of sewage sludge
	– animals will not be allowed to graze on the land for 30 days after application of sewage sludge
	– turf grown on land where sewage sludge is applied is not harvested for 1 yr after application of the sewage sludge when the harvested turf is placed on either land with a high potential for public exposure or a lawn, unless otherwise specified by the permitting authority
	– public access to land with a high potential for public exposure is restricted for 1 yr after application of sewage sludge
	– public access to land with a low potential for public exposure is restricted for 30 days after application of sewage sludge.)
	
	Verify that the Class A pathogen requirements (see definition of *Class A Sewage Sludge*) are met when:
	
	– bulk sewage sludge is applied to a lawn or a home garden (40 CFR 503.10(b)(1))
	– sewage sludge is sold or given away in a bag or other container for application to the land (40 CFR 503.10(e)).
	
	Verify that either of the following requirements are met when domestic septage is applied to agricultural land, forest, or a reclamation site:
	
	– compliance with the site restrictions associated with Class B Sewage Sludge (see previous NOTE)
	– the pH of domestic septage is raised to 12 or higher by alkali addition and, without the addition of more alkali, remains at 12 or higher for 30 minutes and the following site restrictions are met:
	    – food crops with harvested parts that touch the sewage sludge/soil mixture and are totally above the land surface will not be harvested for 14 mo after application of sewage sludge
	    – food crops with harvested parts below the surface of the land will not be harvested for 20 mo after application of sewage sludge when the sewage sludge remains on the land surface for 4 mo or longer prior to incorporation into the soil

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	– food crops with harvested parts below the surface of the land will not be harvested for 38 mo after application of sewage sludge when the sewage sludge remains on the land surface for less than 4 mo prior to incorporation into the soil – food crops, feed crops, and fiber crops will not be harvested for 30 days after application of sewage sludge. Verify that one of the vector attraction reduction requirements in paragraphs 1 through 10 of the definition of *Vector Attraction Reduction Options* is met when bulk sewage sludge is applied to agricultural land, forest, a public contact site, or a reclamation site. Verify that one of the vector attraction reduction requirements in paragraphs 1 through 8 of the definition of *Vector Attraction Reduction Options* is met when bulk sewage sludge is applied to a lawn or a home garden. Verify that one of the vector attraction reduction requirements in paragraphs 1 through 8 of the definition of *Vector Attraction Reduction Options* is met when sewage sludge is sold or given away in a bag or other container for application to the land. Verify that the vector requirements in paragraphs 9, 10, or 12 of the definition of *Vector Attraction Reduction Options* is met when domestic septage is applied to agricultural land, forest, or a reclamation site.
MWW.120.6. Monitoring of land application sludge is required to be done according to specific parameters (40 CFR 503.16).	Verify that the frequency of monitoring for the following is done according to the frequencies listed in Table 5 of Appendix B of this document: – the pollutants listed in Table 1, Table 2, Table 3 and Table 4 of Appendix B of this document – the pathogen density requirements and the vector attraction reduction (see checklist item MWW.120.5). (NOTE: After the sewage sludge has been monitored for 2 yr at the frequency in Table 5 of Appendix B of this document, the permitting authority may reduce the frequency of monitoring for pollutant concentrations and for the pathogen density requirements, but in no case shall the frequency of monitoring be less than once per year when sewage sludge is applied to the land.) Verify that, if either the following pathogen requirements or the vector attraction reduction requirements are met when domestic septage is applied to agricultural land, forest, or a reclamation site, each container of domestic septage applied to the land is monitored for compliance with these requirements.

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	– the pH of domestic septage is raised to 12 or higher by alkali addition and, without the addition of more alkali, remains at 12 or higher for 30 minutes and the following site restrictions are met:
	    – food crops with harvested parts that touch the sewage sludge/soil mixture and are totally above the land surface will not be harvested for 14 mo after application of sewage sludge
	    – food crops with harvested parts below the surface of the land will not be harvested for 20 mo after application of sewage sludge when the sewage sludge remains on the land surface for 4 mo or longer prior to incorporation into the soil
	    – food crops with harvested parts below the surface of the land will not be harvested for 38 mo after application of sewage sludge when the sewage sludge remains on the land surface for less than 4 mo prior to incorporation into the soil
	    – food crops, feed crops, and fiber crops will not be harvested for 30 days after application of sewage sludge
	– the pH of domestic septage is raised to 12 or higher by alkali addition and, without the addition of more alkali, shall remain at 12 or higher for 30 min.

MWW.120.7. Specific recordkeeping requirements must be met by preparers of sewage sludge (40 CFR 503.17(a)(1)).	(NOTE: This checklist item applies to persons who prepares the following sewage that meets the pollutant concentrations in Table 1 of Appendix B of this document, the Class A pathogen requirements (see definition for *Class A Sewage Sludge*), and one of the vector attraction reduction requirements (see definition for *Vector Attraction Reduction Options):*
	    – bulk sewage sludge applied to the land
	    – sewage sludge sold or given away in a bag or other container for application to the land.)
	
	Verify that the preparer develops the following information and retains the information for 5 yr:
	
	    – the concentration of each pollutant listed in Table 1 of Appendix B of this document in the sewage sludge
	    – the following certification statement:
	        "I certify, under penalty of law, that the Class A pathogen requirements in Sec. 503.32(a) and the vector attraction reduction requirement in [insert one of the vector attraction reduction requirements in Sec. 503.33(b)(1) through Sec. 503.33(b)(8)] have been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the pathogen requirements and vector attraction reduction requirements have been met. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."

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	– a description of how the Class A pathogen requirements (see definition for *Class A Sewage Sludge* in this document) are met. – a description of how one of the vector attraction reduction requirements (see definition for *Vector Attraction Reduction Options* in this document) is met.
MWW.120.8. Specific recordkeeping requirements must be met by persons deriving materials from sewage sludge (40 CFR 503.17(a)(2)).	(NOTE: This checklist item applies to persons who prepares the following sewage that meets the pollutant concentrations in Table 1 of Appendix B of this document, the Class A pathogen requirements (see definition for *Class A Sewage Sludge* in this document), and one of the vector attraction reduction requirements (see definition for *Vector Attraction Reduction Options* in this document): – when a bulk material derived from sewage sludge is applied to the land – when a material derived from sewage sludge is sold or given away in a bag or other container for application to the land.) Verify that the person who derives the material develops the following information and retains the information for 5 yr: – the concentration of each pollutant listed in Table I of Appendix B of this document – the following certification statement: "I certify, under penalty of law, that the Class A pathogen requirements in Sec. 503.32(a) and the vector attraction reduction requirement in [insert one of the vector attraction reduction requirements in Sec. 503.33 (b)(1) through (b)(8)] have been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the pathogen requirements and the vector attraction reduction requirements have been met. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment." – a description of how the Class A pathogen requirements (see definition for *Class A Sewage Sludge* in this document) are met – a description of how one of the vector attraction reduction requirements (see definition for *Vector Attraction Reduction Options* in this document) is met.

<table>
<tr><th colspan="2">COMPLIANCE CATEGORY:
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<tr><th>REGULATORY REQUIREMENT OR MANAGEMENT PRACTICE</th><th>REVIEWER CHECKS</th></tr>
<tr><td>MWW.120.9. Specific recordkeeping requirements must be met when bulk sewage sludge meeting the pollutant concentrations in Table 1 of Appendix B of this document, the Class A pathogen requirements, and certain vector attraction reduction requirements, is applied to agricultural land, forest, a public contact site, or a reclamation site (40 CFR 503.17(a)(3)).</td><td>(NOTE: This checklist item applies to the application of bulk sewage sludge to agricultural land, forest, a public contact site, or a reclamation site.)

Verify that, if the pollutant concentrations in Table 1 of Appendix B of this document, the Class A pathogen requirements (see definition for Class A Sewage Sludge in this document), and the vector attraction reduction requirements (see paragraph 9 or 10 in the definition for Vector Attraction Reduction Options in this document) are met, the person who prepares the bulk sewage sludge develops the following information and retains the information for 5 yr:

– the concentration of each pollutant listed in Table 1 of Appendix B of this document in the bulk sewage sludge
– the following certification statement:
"I certify, under penalty of law, that the pathogen requirements in Sec. 503.32(a) have been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the pathogen requirements have been met. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."
– a description of how the Class A pathogen requirements (see definition for Class A Sewage Sludge in this document) are met.

Verify that, if the pollutant concentrations in Table 1 of Appendix B of this document, the Class A pathogen requirements (see definition for Class A Sewage Sludge in this document), and the vector attraction reduction requirements (see paragraph 9 or 10 in the definition for Vector Attraction Reduction Options in this document) are met, the person who applies the bulk sewage sludge develops the following information and retains the information for 5 yr:

– the following certification statement:
"I certify, under penalty of law, that the management practices in Sec. 503.14 and the vector attraction reduction requirement in [insert either Sec. 503.33 (b)(9) or (b)(10)] have been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the management practices and vector attraction reduction requirements have been met. I am aware that there are significant penalties for false certification including fine and imprisonment."
– a description of how the management practices in 40 CFR 503.14 (see checklist item MWW.120.4) are met for each site on which bulk sewage sludge is applied
– a description of how the vector attraction reduction requirements (see paragraph 9 or 10 in the definition for Vector Attraction Reduction Options</td></tr>
</table>

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	in this document*)* are met for each site on which bulk sewage sludge is applied.
MWW.120.10. Specific recordkeeping requirements must be met when bulk sewage sludge meeting the pollutant concentrations in Table 1 of Appendix B of this document and the Class B pathogen requirements is applied to agricultural land, forest, a public contact site, or a reclamation site (40 CFR 503.17(a)(4)).	(NOTE: This checklist item applies to the application of bulk sewage sludge to agricultural land, forest, a public contact site, or a reclamation site.) Verify that, if the pollutant concentrations in Table 1 of Appendix B of this document and the Class B pathogen requirements (see definition for *Class B Sewage Sludge* in this document) are met, the person who prepares the bulk sewage sludge develops the following information and retains the information for 5 yr: – the concentration of each pollutant listed in Table 1 of Appendix B of this document in the bulk sewage sludge – the following certification statement: "I certify under, penalty of law, that the Class B pathogen requirements in Sec. 503.32(b) and the vector attraction reduction requirement in [insert one of the vector attraction reduction requirements in Sec. 503.33 (b)(1) through (b)(8) if one of those requirements is met] have been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the pathogen requirements [and vector attraction reduction requirements if applicable] have been met. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment." – a description of how the Class B pathogen requirements (see definition for *Class B Sewage Sludge* in this document) are met – a description of how the vector attraction reduction requirements (see paragraphs 1 through 8 in the definition for *Vector Attraction Reduction Options* in this document*)* are met for each site on which bulk sewage sludge is applied. Verify that, if the pollutant concentrations in Table 1 of Appendix B of this document and the Class B pathogen requirements (see definition for *Class B Sewage Sludge* in this document) are met, the person who applies the bulk sewage sludge develops the following information and retains the information for 5 yr: – the following certification statement: "I certify, under penalty of law, that the management practices in Sec. 503.14, the site restrictions in Sec. 503.32(b)(5), and the vector attraction reduction requirements in [insert either Sec. 503.33 (b)(9) or (b)(10), if one of those requirements is met] have been met for each site on which bulk sewage sludge is applied. This determination has been made under my direction and supervision in accordance with the system designed to

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	ensure that qualified personnel properly gather and evaluate the information used to determine that the management practices and site restrictions [and the vector attraction reduction requirements if applicable] have been met. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment." – a description of how the management practices in 40 CFR 503.14 (see checklist item MWW.120.4) are met for each site on which bulk sewage sludge is applied – a description of how the following site restrictions are met for each site on which bulk sewage sludge is applied: – food crops with harvested parts that touch the sewage sludge/soil mixture and are totally above the land surface will not be harvested for 14 mo after application of sewage sludge – food crops with harvested parts below the surface of the land will not be harvested for 20 mo after application of sewage sludge when the sewage sludge remains on the land surface for 4 mo or longer prior to incorporation into the soil – food crops with harvested parts below the surface of the land will not be harvested for 38 mo after application of sewage sludge when the sewage sludge remains on the land surface for less than 4 mo prior to incorporation into the soil – food crops, feed crops, and fiber crops will not be harvested for 30 days after application of sewage sludge – animals will not be allowed to graze on the land for 30 days after application of sewage sludge – turf grown on land where sewage sludge is applied is not harvested for 1 yr after application of the sewage sludge when the harvested turf is placed on either land with a high potential for public exposure or a lawn, unless otherwise specified by the permitting authority – public access to land with a high potential for public exposure is restricted for 1 yr after application of sewage sludge – public access to land with a low potential for public exposure is restricted for 30 days after application of sewage sludge – a description of how the vector attraction reduction requirements (see paragraph 9 or 10 in the definition for *Vector Attraction Reduction Options* in this document*)* are met for each site on which bulk sewage sludge is applied.

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MWW.120.11. Specific recordkeeping requirements must be met when the cumulative loading rate for each pollutant does not exceed the cumulative pollutant loading rate for the pollutant in bulk sewage sludge applied to agricultural land, forest, a public contact site, or a reclamation site (40 CFR 503.17(a)(5)).	Verify that, if the cumulative loading rate for each pollutant does not exceed the cumulative pollutant loading rate for the pollutant in Table 2 Appendix B of this document are met when bulk sewage sludge is applied to agricultural land, forest, a public contact site, or a reclamation site, the person who prepares the bulk sewage sludge develops the following information and retains the information for 5 yr: – the concentration of each pollutant listed in Table 3 of Appendix B of this document in the bulk sewage sludge – the following certification statement: "I certify, under penalty of law, that the pathogen requirements in [insert either Sec. 503.32(a) or Sec. 503.32(b)] and the vector attraction reduction requirement in [insert one of the vector attraction reduction requirements in Sec. 503.33 (b)(1) through (b)(8) if one of those requirements is met] have been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the pathogen requirements [and vector attraction reduction requirements] have been met. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment." – a description of how either the Class A or Class B pathogen requirements are met (see the definitions for *Class A Sewage Sludge* and *Class B Sewage Sludge* in this document) – a description of how the vector attraction reduction requirements (see paragraph 1 through 8 in the definition for *Vector Attraction Reduction Options* in this document*)* are met for each site on which bulk sewage sludge is applied. Verify that, if the cumulative loading rate for each pollutant does not exceed the cumulative pollutant loading rate for the pollutant in Table 2, Appendix B of this document are met when bulk sewage sludge is applied to agricultural land, forest, a public contact site, or a reclamation site, the person who applies the bulk sewage sludge develops the following information and retains the information indefinitely: – the location, by either street address or latitude and longitude, of each site on which bulk sewage sludge is applied – the number of hectares in each site on which bulk sewage sludge is applied – the date and time bulk sewage sludge is applied to each site – the cumulative amount of each pollutant (i.e., kilograms) listed in Table 2 of Appendix B of this document in the bulk sewage sludge applied to each site, including the cumulative amount of each pollutant in the bulk sewage sludge applied to the site after July 20, 1993 – the amount of sewage sludge (i.e., metric tons) applied to each site – the following certification statement:

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	"I certify, under penalty of law, that the requirements to obtain information in Sec. 503.12(e)(2) have been met for each site on which bulk sewage sludge is applied. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the requirements to obtain information have been met. I am aware that there are significant penalties for false certification including fine and imprisonment." – a description of how the requirements to obtain information on whether bulk sewage sludge subject to the cumulative pollutant loading rates has been applied to the site since July 20, 1993. Verify that, if the cumulative loading rate for each pollutant does not exceed the cumulative pollutant loading rate for the pollutant in Table 2 Appendix B of this document are met when bulk sewage sludge is applied to agricultural land, forest, a public contact site, or a reclamation site, the person who applies the bulk sewage sludge develops the following information and retains the information for 5 yr. – the following certification statement: "I certify, under penalty of law, that the management practices in Sec. 503.14 have been met for each site on which bulk sewage sludge is applied. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the management practices have been met. I am aware that there are significant penalties for false certification including fine and imprisonment." – a description of how the management practices in 40 CFR 503.14 (see checklist item MWW.120.4) are met for each site on which bulk sewage sludge is applied – the following certification statement when the bulk sewage sludge meets the Class B pathogen requirements (see the definition of *Class B Sewage Sludge* in this document: "I certify, under penalty of law, that the site restrictions in Sec. 503.32(b)(5) have been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the site restrictions have been met. I am aware that there are significant penalties for false certification including fine and imprisonment." – a description of how the following site restrictions are met for each site on which Class B bulk sewage sludge is applied: – food crops with harvested parts that touch the sewage sludge/soil mixture and are totally above the land surface will not be harvested for 14 mo after application of sewage sludge

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	– food crops with harvested parts below the surface of the land will not be harvested for 20 mo after application of sewage sludge when the sewage sludge remains on the land surface for 4 mo or longer prior to incorporation into the soil – food crops with harvested parts below the surface of the land will not be harvested for 38 mo after application of sewage sludge when the sewage sludge remains on the land surface for less than 4 mo prior to incorporation into the soil – food crops, feed crops, and fiber crops will not be harvested for 30 days after application of sewage sludge – animals will not be allowed to graze on the land for 30 days after application of sewage sludge – turf grown on land where sewage sludge is applied is not harvested for 1 yr after application of the sewage sludge when the harvested turf is placed on either land with a high potential for public exposure or a lawn, unless otherwise specified by the permitting authority – public access to land with a high potential for public exposure is restricted for 1 yr after application of sewage sludge – public access to land with a low potential for public exposure is restricted for 30 days after application of sewage sludge – the following certification statement when the vector attraction reduction requirements are met (see paragraphs 9 or 10 in the definition for *Vector Attraction Reduction Options* in this document): "I certify, under penalty of law, that the vector attraction reduction requirement in [insert either Sec. 503.33(b)(9) or Sec. 503.33(b)(10)] has been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the vector attraction reduction requirement has been met. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment." – if the vector attraction reduction requirements are met (see paragraphs 9 or 10 in the definition for *Vector Attraction Reduction Options* in this document), a description of how the requirements are met.
MWW.120.12. Specific recordkeeping requirements must be met when sewage sludge is sold or given away in a bag or other container for application to the land (40 CFR 503.17(a)(6)).	(NOTE: This checklist applies when the product of the concentration of each pollutant in the sewage sludge and the annual whole sludge application rate for the sewage sludge do not cause the annual pollutant loading rate for the pollutant in Table 4 of Appendix B of this document to be exceeded when sewage sludge is sold or given away in a bag or other container for application to the land.) Verify that, the person who prepares the sewage sludge that is sold or given away in a bag or other container develops the following information and retains the

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	information for 5 yr: – the annual whole sludge application rate for the sewage sludge that does not cause the annual pollutant loading rates in Table 4 of Appendix B of this document to be exceeded – the concentration of each pollutant listed in Table 4 of Appendix B of this document in the sewage sludge – the following certification statement: "I certify, under penalty of law, that the management practice in Sec. 503.14(e), the Class A pathogen requirement in Sec. 503.32(a), and the vector attraction reduction requirement in [insert one of the vector attraction reduction requirements in Sec. 503.33 (b)(1) through (b)(8)] have been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the management practice, pathogen requirements, and vector attraction reduction requirements have been met. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment." – a description of how the Class A pathogen requirements are met (see the definition of *Class A Sewage Sludge* in this document) – a description of how the vector attraction requirements are met (see paragraphs 1 through 8 in the definition for *Vector Attraction Reduction Options* in this document).
MWW.120.13. Specific recordkeeping requirements must be met when domestic septage is applied to agricultural land, forest, a public contact site, or a reclamation site (40 CFR 503.17(b)).	Verify that, when domestic septage is applied to agricultural land, forest, or a reclamation site, the person who applies the domestic septage develops the following information and retains the information for 5 yr: – the location, by either street address or latitude and longitude, of each site on which domestic septage is applied – the number of acres in each site on which domestic septage is applied – the date and time domestic septage is applied to each site – the nitrogen requirement for the crop or vegetation grown on each site during a 365 day period – the rate, in gallons per acre per 365 day period, at which domestic septage is applied to each site – the following certification statement: "I certify, under penalty of law, that the pathogen requirements in [insert either Sec. 503.32(c)(1) or Sec. 503.32(c)(2)] and the vector attraction reduction requirements in [insert Sec. 503.33(b)(9), Sec. 503.33(b)(10), or Sec. 503.33(b)(12)] have been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate

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	the information used to determine that the pathogen requirements and vector attraction reduction requirements have been met. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment." – a description of how the one of the following pathogen requirements are met: – the following site restrictions are met when domestic septage is applied to agricultural land, forest, or a reclamation site: – food crops with harvested parts that touch the sewage sludge/soil mixture and are totally above the land surface will not be harvested for 14 mo after application of sewage sludge – food crops with harvested parts below the surface of the land will not be harvested for 20 mo after application of sewage sludge when the sewage sludge remains on the land surface for 4 mo or longer prior to incorporation into the soil – food crops with harvested parts below the surface of the land will not be harvested for 38 mo after application of sewage sludge when the sewage sludge remains on the land surface for less than 4 mo prior to incorporation into the soil – food crops, feed crops, and fiber crops will not be harvested for 30 days after application of sewage sludge – animals will not be allowed to graze on the land for 30 days after application of sewage sludge – turf grown on land where sewage sludge is applied is not harvested for 1 yr after application of the sewage sludge when the harvested turf is placed on either land with a high potential for public exposure or a lawn, unless otherwise specified by the permitting authority – public access to land with a high potential for public exposure is restricted for 1 yr after application of sewage sludge – public access to land with a low potential for public exposure is restricted for 30 days after application of sewage sludge – the pH of domestic septage applied to agricultural land, forest, or a reclamation site is raised to 12 or higher by alkali addition and, without the addition of more alkali, remains at 12 or higher for 30 min and the following site restrictions are met: – food crops with harvested parts that touch the sewage sludge/soil mixture and are totally above the land surface will not be harvested for 14 mo after application of sewage sludge – food crops with harvested parts below the surface of the land will not be harvested for 20 mo after application of sewage sludge when the sewage sludge remains on the land surface for 4 mo or longer prior to incorporation into the soil – food crops with harvested parts below the surface of the land will not be harvested for 38 mo after application of sewage sludge when the sewage sludge remains on the land surface for less than 4

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	mo prior to incorporation into the soil – food crops, feed crops, and fiber crops will not be harvested for 30 days after application of sewage sludge – a description of how the vector attraction reduction requirements are met (see paragraphs 9, 10, or 12 in the definition for *Vector Attraction Reduction Options* in this document).
MWW.120.14. Certain facilities are required to submit specific information to the permitting authority (40 CFR 503.18).	Verify that Class I sludge management facilities, POTWs (as defined in 40 CFR 501.2) with a design flow rate equal to or greater than one million gallons per day, and POTWs that serve 10,000 people or more submit the following information to the permitting authority: – the information in 40 CFR 503.17(a) (see checklist items MWW.120.7 through MWW.120.12), except the following information, on February 19 of each year: – the information required for persons applying bulk sewage sludge meeting the pollutant concentrations in Table 1 of Appendix B of this document, the Class A pathogen requirements, and certain vector attraction reduction requirements, to agricultural land, forest, a public contact site, or a reclamation site (40 CFR 503.17(a)(3)(ii), see checklist item MWW.120.9) – the information required for persons applying bulk sewage sludge meeting the pollutant concentrations in Table 1 of Appendix B of this document and the Class B pathogen requirements to agricultural land, forest, a public contact site, or a reclamation site (40 CFR 503.17(a)(4)(ii), see checklist item MWW.120.10) – the information required for persons applying bulk sewage sludge to agricultural land, forest, a public contact site, or a reclamation site when the cumulative loading rate for each pollutant does not exceed the cumulative pollutant loading rate for the pollutant in bulk sewage sludge 40 CFR 503.17(a)(5)(ii), see checklist item MWW.120.11) – the following information each year when 90 percent or more of any of the cumulative pollutant loading rates in Table 2 of Appendix B of this document is reached at a site: – the location, by either street address or latitude and longitude, of each site on which bulk sewage sludge is applied – the number of hectares in each site on which bulk sewage sludge is applied – the date and time bulk sewage sludge is applied to each site – the cumulative amount of each pollutant (i.e., kilograms) listed in Table 2 of Appendix B of this document in the bulk sewage sludge applied to each site, including the cumulative amount of each pollutant in the bulk sewage sludge applied to the site after July 20, 1993 – the amount of sewage sludge (i.e., metric tons) applied to each site

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	– the following certification statement: "I certify, under penalty of law, that the requirements to obtain information in Sec. 503.12(e)(2) have been met for each site on which bulk sewage sludge is applied. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the requirements to obtain information have been met. I am aware that there are significant penalties for false certification including fine and imprisonment." – a description of how the requirements to obtain information on whether bulk sewage sludge subject to the cumulative pollutant loading rates has been applied to the site since July 20, 1993.

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USE OR DISPOSAL OF SEWAGE SLUDGE **MWW.200** **Surface Disposal**	(NOTE: These general requirements apply to the final use and disposal of sewage sludge generated during the treatment of domestic sewage in a treatment works. For exclusions see the definition of the term *Exempted Sewage Sludge* in this document (40 CFR 503.1(a)).) (NOTE: The requirements concerning the surface disposal of sludge apply to any person who prepares sewage sludge that is placed on a surface disposal site, to the owner/operator of a surface disposal site, to sewage sludge placed on a surface disposal site, and to a surface disposal site. The requirements concerning surface disposal of sludge do not apply to sewage sludge stored on the land or to the land on which sewage sludge is stored. It also does not apply to sewage sludge that remains on the land for longer than 2 yr when the preparer of the sewage sludge demonstrates that the land on which the sewage sludge remains is not an active sewage sludge unit. It also does not apply to sewage treated on the land or to the land on which the sewage sludge is treated (40 CFR 503.20).)
MWW.200.1. In order to substantiate the claim of exemption from the requirements for surface disposal, the person who prepares sewage sludge that remains on the land for longer than 2 yr is required to maintain certain information (40 CFR 503.20(b)).	Verify that, in order to substantiate the claim of exemption from the requirements for surface disposal, the person who prepares sewage sludge that remains on the land for longer than 2 yr maintains documentation of the following: – the name and address of the person who prepares the sewage sludge – the name and address of the person who either owns the land or leases the land – the location, by either street address or latitude and longitude, of the land – an explanation of why sewage sludge needs to remain on the land for longer than 2 yr prior to final use or disposal – the approximate time period when the sewage sludge will be used or disposed.
MWW.200.2. An active sewage sludge unit that is located within 60 m of a fault that has displacement in Holocene time, is located in an unstable area pursuant to either section 402 or 404 of the CWA is required to close by March 22, 1994 (40 CFR 503.22(b)).	Determine if there is a sewage sludge unit that is located within 60 m of a fault that has displacement in Holocene time, is located in an unstable area pursuant to either section 402 or 404 of the CWA. Verify that the unit was closed by March 22, 1994 unless, in the case of an active sewage sludge unit located within 60 m of a fault that has displacement in Holocene time, otherwise specified by the permitting authority. (NOTE: If such a unit is not closed and not otherwise specified by the permitting authority, steps should be taken to close the facility as soon as possible.)

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MWW.200.3. A written closure and postclosure plan that meets specific requirements must be submitted to the permitting authority 180 days prior to the date of closure of an active sewage sludge unit (40 CFR 503.22(c)).	<u>Closure/Postclosure Plan</u> Determine if there are plans to close an active sewage sludge unit or if one has recently been closed. Verify that the closure and postclosure plan was submitted to the permitting authority at least 180 days in advance of closure and the plan contained the following: – a discussion of how the leachate collection system will be operated and maintained for 3 yr after closure if the unit has a liner and leachate collection system – a description of the system used to monitor for methane gas in the air in any structure within the surface disposal site and in the air at the property line of the surface disposal site – a discussion of how public access will be restricted for 3 yr after the last sewage sludge was placed on the land.
MWW.200.4. The owner of a surface disposal site is required to provide written notification to the subsequent owner of the site that sewage sludge was placed on the land (40 CFR 503.22(d)).	Verify that if there are plans to turn the surface disposal site over to another owner, the subsequent owner is notified that sewage sludge was placed on the land.
MWW.200.5. Active sewage sludge units without a liner and leachate collection system are required to meet specific standards (40 CFR 503.23).	Verify that the following concentrations are not exceeded in sewage sludge placed on an active sewage sludge unit without a liner and leachate collection system: – arsenic: 73 mg/kg – chromium: 600 mg/kg – nickel: 420 mg/kg. (NOTE: Amounts are based on a dry weight basis.) (NOTE: At the time of permit application, the owner/operator of a surface disposal site may request site-specific pollutant limits for an active sewage sludge unit without a liner and leachate collection system when the existing values for site parameters specified by the permitting authority are different from the values for those parameters used to develop the above pollutant limits and when the permitting authority determines that site-specific pollutant limits are appropriate for the active sewage sludge unit.)

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	Verify that, the concentration of each pollutant listed above in sewage sludge placed on an active sewage sludge unit without a liner and leachate collection system, does not exceed either the concentration for the pollutant determined during a site-specific assessment, as specified by the permitting authority, or the existing concentration of the pollutant in the sewage sludge, whichever is lower. Verify that, except when there are site specific limits, the concentration of arsenic, chromium, and nickel in sewage sludge placed on an active sewage sludge unit whose boundary is less than 150 m from the property line of the surface disposal site does not exceed the concentration determined using the following procedure: – the actual distance from the active sewage sludge unit boundary to the property line of the surface disposal site is determined – the concentration of each pollutant listed in Table 1, Appendix C of this document in the sewage sludge does not exceed the concentration that corresponds to the actual distance in Table 1, Appendix C of this document.
MWW.200.6. Sewage sludge units are required to be operated according to specific operation and management standards (40 CFR 503.24).	Verify that sewage sludge is not placed in an active sewage sludge unit if it is likely to adversely affect a threatened or endangered species listed under section 4 of the Endangered Species Act, or its designated critical habitat. Verify that active sewage sludge units: – do not restrict the flow of a base flood – are located 60 m or more from a fault that has displacement in Holocene time, unless otherwise specified by the permitting authority – are not located in an unstable area – will not contaminate an aquifer – are not located in a wetland unless by permit under 402 or 404 of the CWA. (NOTE: The results of a groundwater monitoring program developed by a qualified groundwater scientist or a certification by a qualified groundwater scientist will be used to demonstrate that sewage sludge placed on an active sewage sludge unit does not contaminate an aquifer.) Verify that when a surface disposal site is located in a seismic impact zone, the unit is designed to withstand the maximum recorded horizontal ground level acceleration. Verify that for runoff the following occurs: – the runoff is collected and disposed of in accordance with an NPDES permit and any other applicable requirements – the runoff collection system has the capacity to handle runoff from a 24-h,

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	25- yr storm event. Verify that leachate is handled so that: – the leachate collection system for an active sewage sludge unit that has a liner and leachate collection system is operated and maintained during the period the sewage sludge unit is active and for 3 yr after the sewage sludge unit closes – leachate from an active sewage sludge unit that has a liner and a leachate collection system is collected and disposed of in accordance with the applicable requirements from when the unit is active and for 3 yr after the sewage sludge unit closes. Verify that the following occurs when a cover is placed on an active sewage sludge unit: – the concentration of methane gas in the air in any structure within the surface disposal site of an active unit does not exceed 25 percent of the lower explosive limit for methane gas during the period that the unit is active and the concentration of the methane gas in air at the property line of the surface disposal site does not exceed the lower explosive limit for methane gas during the period that the sewage sludge unit is active – at closure when the final cover is placed the concentration of methane gas in air in any structure within any structure within the surface disposal site does not exceed 25 percent of the lower explosive limit for methane gas for 3 yr after the unit closes and the concentration of methane gas in air at the property line of the unit does not exceed the lower explosive limit for methane gas 3 yr after closure unless otherwise specified by the permitting authority. Verify that a food or feed crop or a fiber crop are not grown on an active sewage sludge unit unless it has been demonstrated to the permitting authority that through management practices, public health and the environment are protected from any reasonably anticipated adverse effects. Verify that animals are not grazed on an active sewage sludge unit unless it has been demonstrated to the permitting authority that through management practices, public health and the environment are protected from any reasonably anticipated adverse effects. Verify that public access is restricted for the period that the surface disposal site contains an active unit, and for 3 yr after the last active sewage sludge unit in the surface disposal site closes.

COMPLIANCE CATEGORY: MUNICIPAL WASTEWATER MANAGEMENT	
REGULATORY REQUIREMENT OR MANAGEMENT PRACTICE	**REVIEWER CHECKS**
MWW.200.7. Class A or one of the Class B pathogen requirements (see definitions in this document) must be met when placing sewage sludge on an active sewage sludge unit unless it is covered with soil or other material at the end of each operating day (40 CFR 503.25(a)).	Verify that sewage sludge being placed on an active sewage sludge unit meets Class A or one of the Class B pathogen requirements. Verify that if the sludge does not meet pathogen requirements, it is covered with soil or other material at the end of each operating day.
MWW.200.8. Vector attraction reduction must be done when sewage sludge or domestic septage is placed on an active sewage sludge unit (40 CFR 503.25(b) and 503.25(c)).	Verify that, when other than domestic septage is placed on an active sewage sludge unit, one of the vector attraction reduction requirements (see paragraphs 1 through 11 of the definition for *Vector Attraction Reduction Options* in this document) are met when sewage sludge is placed on an active sewage sludge unit. Verify that, when domestic septage is placed on an active sewage sludge unit, one of the vector attraction reduction requirements (see paragraphs 9 through 12 of the definition for *Vector Attraction Reduction Options* in this document) are met when domestic septage is placed on an active sewage sludge unit.
MWW.200.9. Monitoring for pollutants, pathogens, and vector attraction reduction requirements for sewage sludge placed on an active sewage sludge unit must be done according to the frequency in Table 2, Appendix C of this document (40 CFR 503.26(a)).	Verify that monitoring for pollutants, pathogens, and vector attraction reduction requirements for sewage sludge, other than domestic septage, placed on an active sewage sludge unit is done according to the frequency in Table 2, Appendix C of this document. (NOTE: The permitting authority may reduce the frequency of monitoring after the sewage sludge has been monitored for 2 yr at the required frequencies.)
MWW.200.10. If, when domestic septage is placed on an active sewage sludge unit, the pH of the septage is raised to 12 or higher by alkali addition and remains at 12 or higher without alkali addition for 30 min, each container of domestic septage must be monitored (40 CFR 503.26(b)).	Verify that when domestic septage is placed on an active sewage sludge unit and the pH of the septage is raised to 12 or higher by alkali addition and remains at 12 or higher without alkali addition for 30 min, each container of domestic septage is monitored.

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MWW.200.11. In specific circumstances, air in structures within a surface disposal site and at property lines of the surface disposal site are required to be monitored continuously for methane gas (40 CFR 503.26(c).	Verify that continuous monitoring for methane gas occurs during the period that the surface disposal site contains an active sewage sludge unit on which the sewage sludge is covered and for 3 yr after a unit closes when a final cover is placed on the sewage sludge.
MWW.200.12. Specific recordkeeping requirements must be met when sewage sludge, other than domestic septage, is placed on an active sewage sludge unit (40 CFR 503.27(a)).	Verify that the person who prepares sewage sludge retains the following information for 5 yr: – the concentration of arsenic, chromium and nickel in the sludge – the following certification statement: "I certify, under penalty of law, that the information that will be used to determine compliance with the pathogen requirements in (insert Sec. 503.32(a), Sec. 503.32(b)(2), Sec. 503.32(b)(3), or Sec. 503.32(b)(4) when one of those requirements is met) and the vector attraction reduction requirement in (insert one of the vector attraction reduction requirements in Sec. 503.33(b)(1) through (b)(8) if one of those requirements is met) was prepared under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate this information. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment." – a description of how the pathogen requirements are being met when done – a description of how the vector attraction reduction requirements are being met when done. Verify that the owner/operator of the surface disposal site retains the following for 5 yr: – the concentrations of the pollutants listed in Table 1, Appendix C of this document – the following certification statement: "I certify, under penalty of law, that the information that will be used to determine compliance with the management practices in Sec. 503.24 and the vector attraction reduction requirement in (insert one of the requirements in Sec. 503.33(b)(9) through Sec. 503.33(b)(11) if one of those requirements is met) was prepared under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate this information. I am

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	aware that there are significant penalties for false certification including the possibility of fine and imprisonment." – a description of how the management practices in 40 CFR 503.24 (see checklist item MWW.200.6) are being met – a description of how the vector attraction reduction requirements are being met when they are done.
MWW.200.13. Specific recordkeeping requirements must be met when domestic septage is placed on an active sewage sludge unit (40 CFR 503.27(b)).	Verify that the person who applies domestic septage with a pH of greater than 12 retains the following information for 5 yr: – the following statement: "I certify, under penalty of law, that the information that will be used to determine compliance with the vector attraction reduction requirements in Sec. 503.33(b)(12) was prepared under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate this information. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment." – a description of how the vector attraction reduction requirements are being met when done. Verify that the owner/operator of the surface disposal site retains the following for 5 yr: – the following statement: "I certify, under penalty of law, that the information that will be used to determine compliance with the management practices in Sec. 503.24 and the vector attraction reduction requirements in (insert Sec. 503.33(b)(9) through Sec. 503.33(b)(11) if one of those requirements is met) was prepared under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate this information. I am aware that there are significant penalties for false certification including the possibility of fine or imprisonment." – a description of how the management practices of 40 CFR 503.24 (see checklist item MWW.200.6) are being met – a description of how the vector attraction reduction requirements are being met when they are done.

COMPLIANCE CATEGORY: MUNICIPAL WASTEWATER MANAGEMENT	
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MWW.200.14. Class I sludge management facilities, POTWs with a design flow rate equal to or greater than 1 million gal/day, and POTWs that serve 10,000 people or more are required to submit specific information to the permitting authority on February 19 of each year (40 CFR 503.28).	Verify that the following information is submitted to the permitting authority on February 19 of each year: – the concentration of arsenic, chromium and nickel in the sludge – the following certification statement: "I certify, under penalty of law, that the pathogen requirements in [insert Sec. 503.32(a), Sec. 503.32(b)(2), Sec. 503.32(b)(3), or Sec. 503.32(b)(4) when one of those requirements is met] and the vector attraction reduction requirements in [insert one of the vector attraction reduction requirements in Sec. 503.33(b)(1) through Sec. 503.33(b)(8) when one of those requirements is met] have been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine the [pathogen requirements and vector attraction reduction requirements if appropriate] have been met. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment." – a description of how the pathogen requirements are being met when done – a description of how the vector attraction reduction requirements are being met when done – the concentrations of the pollutants listed in Table 1, Appendix C of this document – the following certification statement: "I certify, under penalty of law, that the management practices in Sec. 503.24 and the vector attraction reduction requirement in [insert one of the requirements in Sec. 503.33 (b)(9) through (b)(11) if one of those requirements is met] have been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the management practices [and the vector attraction reduction requirements if appropriate] have been met. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment." – a description of how the management practices in 40 CFR 503.24 (see checklist item MWW.200.6) are being met.

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USE OR DISPOSAL OF SEWAGE SLUDGE **MWW.240** **Incineration**	(NOTE: These general requirements apply to the final use and disposal of sewage sludge generated during the treatment of domestic sewage in a treatment works. For exclusions see the definition of the term *Exempted Sewage Sludge* (40 CFR 503.1(a)).) (NOTE: The requirements concerning the incineration of sewage sludge apply to a person who fires sewage sludge in a sewage sludge incinerator, to a sewage sludge incinerator, and to sewage sludge fired in a sewage sludge incinerator. They also apply to the exit gas from a sewage sludge incinerator stack (40 CFR 503.40(a) and 503.40(b)).)
MWW.240.1. Sewage sludge incinerators are required to meet specific pollutant limitations (40 CFR 503.43).	Verify that firing of sewage sludge in a sewage sludge incinerator does not violate the requirements in the National Emission Standard for Beryllium in Subpart C of 40 CFR 61. Verify that firing of sewage sludge in a sewage sludge incinerator does not violate the requirements in the National Emission Standard for Mercury in subpart E of 40 CFR 61. Verify that the daily concentration of lead in sewage sludge fed to a sewage sludge incinerator does not exceed the concentration calculated using the following equation: $C = \frac{0.1 \times NAAQS \times 86{,}400}{DF \times (1 - CE) \times SF}$ Where: C = Daily concentration of lead in sewage sludge in mg/kg of total solids (dry weight basis). NAAQS = National Ambient Air Quality Standard for lead in $\mu g/m^3$. DF = Dispersion factor in micrograms per cubic meter per gram per second. CE = Sewage sludge incinerator control efficiency for lead in hundredths. SF = Sewage sludge feed rate in metric tons per day (dry weight basis). (NOTE: The control efficiency (CE) in the above equation shall be determined from a performance test of the sewage sludge incinerator, as specified by the permitting authority.) (NOTE: When the sewage sludge stack height is 65 m or less, the actual sewage sludge incinerator stack height shall be used in an air dispersion model specified by the permitting authority to determine the dispersion factor (DF) in them above equation. When the sewage sludge incinerator stack height exceeds 65 m, the creditable stack height shall be determined in accordance with 40 CFR 51.100(ii) and the creditable stack height shall be used in an air dispersion model specified

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	by the permitting authority to determine the dispersion factor (DF) in the above equation.) Verify that the daily concentration for arsenic, cadmium, chromium, and nickel in sewage sludge fed to a sewage sludge incinerator each do not exceed the concentration calculated using the following equation: $C = \dfrac{RSC \times 86{,}400}{DF \times (1 - CE) \times SF}$ Where: C = Average daily concentration of arsenic, cadmium, chromium, or nickel in sewage sludge in mg/kg of total solids (dry weight basis). CE = Sewage sludge incinerator control efficiency for arsenic, cadmium, chromium, or nickel in hundredths. DF = Dispersion factor in micrograms per cubic meter per gram per second. RSC = Risk specific concentration for arsenic, cadmium, chromium, or nickel in $\mu g/m^3$. SF = Sewage sludge feed rate in metric tons per day (dry weight basis). (NOTE: See the text of 40 CFR 503.43(d)(2) and 503.43(d)(3) for guidance on calculating the RSC.) (NOTE: When the sewage sludge incinerator stack height is equal to or less than 65 m, the actual sewage sludge incinerator stack height shall be used in an air dispersion model, as specified by the permitting authority, to determine the dispersion factor (DF) in the above equation. When the sewage sludge incinerator stack height is greater than 65 m, the creditable stack height shall be determined in accordance with 40 CFR 51.100(ii) and the creditable stack height shall be used in an air dispersion model, as specified by the permitting authority, to determine the dispersion factor (DF) in the above equation. The control efficiency (CE) in the above equation shall be determined from a performance test of the sewage sludge incinerator, as specified by the permitting authority.) (NOTE: See the text of 40 CFR 503.43(e) for details on air dispersion modeling.)
MWW.240.2. Sewage sludge incinerators are required to meet specific operational standards (40 CFR 503.44).	Verify that the total hydrocarbons concentration in the exit gas from a sewage sludge incinerator is corrected for zero percent moisture by multiplying the measured total hydrocarbons concentration by the correction factor calculated using the following equation: Correction factor (percent moisture) $= \dfrac{1}{(1 - X)}$

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	Where: X=decimal fraction of the percent moisture in the sewage sludge incinerator exit gas in hundredths. Verify that the total hydrocarbons concentration in the exit gas from a sewage sludge incinerator is corrected to seven percent oxygen by multiplying the measured total hydrocarbons concentration by the correction factor calculated using the following equation: $$\text{Correction factor (oxygen)} = \frac{14}{(21 - Y)}$$ Where: Y=Percent oxygen concentration in the sewage sludge incinerator stack exit gas (dry volume/dry volume). Verify that the monthly average concentration for total hydrocarbons in the exit gas from a sewage sludge incinerator stack, corrected for zero percent moisture using the correction factor from the first equation and to seven percent oxygen using the correction factor from the second equation does not exceed 100 parts per million on a volumetric basis when measured using the instrument required by 40 CFR 503.45(a) (see checklist item MWW.240.3).
MWW.240.3. Sewage sludge incinerators are required to meet specific management standards for total hydrocarbons (40 CFR 503.40(c) and 503.45).	Verify that an instrument that measures and records the total hydrocarbons concentration in the sewage sludge incinerator stack exit gas continuously is installed, calibrated, operated, and maintained for each sewage sludge incinerator. Verify that the total hydrocarbons instrument employs a flame ionization detector has a heated sampling line maintained at a temperature of 150 ^{o}C or higher at all times; and is calibrated at least once every 24-h operating period using propane. (NOTE: The requirements for total hydrocarbon instrumentation do not apply if the following conditions are met: – the exit gas from a sewage sludge incinerator stack is monitored continuously for carbon monoxide – the monthly average concentration of carbon monoxide in the exit gas from a sewage sludge incinerator stack, corrected for zero percent moisture and to seven percent oxygen, does not exceed 100 parts per million on a volumetric basis – the person who fires sewage sludge in a sewage sludge incinerator retains the following information for 5 yr: – the carbon monoxide concentrations in the exit gas

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	– a calibration and maintenance log for the instrument used to measure the carbon monoxide concentration – Class I sludge management facilities, POTWs with a design flow rate equal to or greater than one million gallons per day, and POTWs that serve a population of 10,000 people or greater submit the monthly average carbon monoxide concentrations in the exit gas to the permitting authority on February 19 of each year.) Verify that an instrument that measures and records the oxygen concentration in the sewage sludge incinerator stack exit gas continuously is installed, calibrated, operated, and maintained for each sewage sludge incinerator. Verify that an instrument that measures and records information used to determine the moisture content in the sewage sludge incinerator stack exit gas continuously is installed, calibrated, operated, and maintained for each sewage sludge incinerator. Verify that an instrument that measures and records combustion temperatures continuously is installed, calibrated, operated, and maintained for each sewage sludge incinerator. Verify that operation of a sewage sludge incinerator does not cause the operating combustion temperature for the sewage sludge incinerator to exceed the performance test combustion temperature by more than 20 percent. (NOTE: An air pollution control device shall be appropriate for the type of sewage sludge incinerator and the operating parameters for the air pollution control device shall be adequate to indicate proper performance of the air pollution control device. For sewage sludge incinerators subject to the requirements in Subpart O of 40 CFR 60, operation of the air pollution control device shall not violate the requirements for the air pollution control device in subpart O of 40 CFR 60. For all other sewage sludge incinerators, operation of the air pollution control device shall not cause a significant exceedance of the average value for the air pollution control device operating parameters from the performance test. Verify that sewage sludge is not be fired in a sewage sludge incinerator if it is likely to adversely affect a threatened or endangered species listed under section 4 of the Endangered Species Act or its designated critical habitat.
MWW.240.4. Sewage sludge incinerators are required to meet specific monitoring standards (40 CFR 503.40(c) and 503.46).	(NOTE: The frequency of monitoring for beryllium and mercury shall be as specified by the permitting authority.) Verify that the frequency of monitoring for arsenic, cadmium, chromium, lead, and nickel in sewage sludge fed to a sewage sludge incinerator is as outlined in Table 2, Appendix C of this document.

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	(NOTE: After the sewage sludge has been monitored for 2 yr at the frequency in Table 2, Appendix C of this document, the permitting authority may reduce the frequency of monitoring for arsenic, cadmium, chromium, lead, and nickel.)
	
	Verify that the total hydrocarbons concentration and oxygen concentration in the exit gas from a sewage sludge incinerator stack, the information used to measure moisture content in the exit gas, and the combustion temperatures for the sewage sludge incinerator are monitored continuously.
	
	(NOTE: The requirements for total hydrocarbon monitoring do not apply if the following conditions are met:
	– the exit gas from a sewage sludge incinerator stack is monitored continuously for carbon monoxide
	– the monthly average concentration of carbon monoxide in the exit gas from a sewage sludge incinerator stack, corrected for zero percent moisture and to seven percent oxygen, does not exceed 100 parts per million on a volumetric basis
	– the person who fires sewage sludge in a sewage sludge incinerator retains the following information for 5 yr:
	  – the carbon monoxide concentrations in the exit gas
	  – a calibration and maintenance log for the instrument used to measure the carbon monoxide concentration
	– Class I sludge management facilities, POTWs with a design flow rate equal to or greater than one million gallons per day, and POTWs that serve a population of 10,000 people or greater submit the monthly average carbon monoxide concentrations in the exit gas to the permitting authority on February 19 of each year.)
	
	(NOTE: For sewage sludge incinerators subject to the requirements in subpart O of 40 CFR 60, the frequency of monitoring for the appropriate air pollution control device operating parameters shall be the frequency of monitoring in subpart O of 40 CFR 60. For all other sewage sludge incinerators, the appropriate air pollution control device operating parameters shall be at least daily.)

MWW.240.5. Sewage sludge incinerators are required to meet specific recordkeeping standards (40 CFR 503.40(c) and 503.47).	Verify that the person who fires sewage sludge in a sewage sludge incinerator shall develop the following information and retain that information for 5 yr: – the concentration of lead, arsenic, cadmium, chromium, and nickel in the sewage sludge fed to the sewage sludge incinerator – the total hydrocarbons concentration in the exit gas from the sewage sludge incinerator stack – information that indicates the requirements in the National Emission Standard for beryllium in subpart C of 40 CFR 61 are met – information that indicates the requirements in the National Emission

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	Standard for mercury in subpart E of 40 CFR 61 are met
	– the operating combustion temperatures for the sewage sludge incinerator
	– values for the air pollution control device operating parameters
	– the oxygen concentration and information used to measure moisture content in the exit gas from the sewage sludge incinerator stack
	– the sewage sludge feed rate
	– the stack height for the sewage sludge incinerator
	– the dispersion factor for the site where the sewage sludge incinerator is located
	– the control efficiency for lead, arsenic, cadmium, chromium, and nickel for each sewage sludge incinerator
	– the risk specific concentration for chromium calculated using the required equation, if applicable
	– a calibration and maintenance log for the instruments used to measure the total hydrocarbons concentration and oxygen concentration in the exit gas from the sewage sludge incinerator stack, the information needed to determine moisture content in the exit gas, and the combustion temperatures.
	
	(NOTE: The requirements for total hydrocarbon recordkeeping do not apply if the following conditions are met:
	– the exit gas from a sewage sludge incinerator stack is monitored continuously for carbon monoxide
	– the monthly average concentration of carbon monoxide in the exit gas from a sewage sludge incinerator stack, corrected for zero percent moisture and to seven percent oxygen, does not exceed 100 parts per million on a volumetric basis
	– the person who fires sewage sludge in a sewage sludge incinerator retains the following information for 5 yr:
	    – the carbon monoxide concentrations in the exit gas
	    – a calibration and maintenance log for the instrument used to measure the carbon monoxide concentration
	– Class I sludge management facilities, POTWs with a design flow rate equal to or greater than one million gallons per day, and POTWs that serve a population of 10,000 people or greater submit the monthly average carbon monoxide concentrations in the exit gas to the permitting authority on February 19 of each year.)

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MWW.240.6. Class I sludge management facilities, POTWs with a design flow rate equal to or greater than 1 million gal/day, and POTWs that serve 10,000 people or more are required to submit specific information to the permitting authority on February 19 of each year (40 CFR 503.48).	Verify that Class I sludge management facilities, POTWs with a design flow rate equal to or greater than one million gallons per day, and POTWs that serve a population of 10,000 people or greater submit the following information to the permitting authority on February 19 of each year: – the concentration of lead, arsenic, cadmium, chromium, and nickel in the sewage sludge fed to the sewage sludge incinerator – the total hydrocarbons concentrations in the exit gas from the sewage sludge incinerator stack – information that indicates the requirements in the National Emission Standard for beryllium in subpart C of 40 CFR 61 are met – information that indicates the requirements in the National Emission Standard for mercury in subpart E of 40 CFR 61 are met – the combustion temperatures, including the maximum combustion temperature, for the sewage sludge incinerator – values for the air pollution control device operating parameters – the oxygen concentration and information used to measure moisture content in the exit gas from the sewage sludge incinerator stack.

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Appendix A:
Designated Toxic Pollutants (40 CFR 401.15)

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Designated Toxic Pollutants
(40 CFR 401.15)

The following comprise the list of toxic pollutants designated pursuant to section 307(a)(1) of the Act:

1. Acenaphthene
2. Acrolein
3. Acrylonitrile
4. Aldrin/Dieldrin [1]
5. Antimony and compounds [2]
6. Arsenic and compounds
7. Asbestos
8. Benzene
9. Benzidine [1]
10. Beryllium and compounds
11. Cadmium and compounds
12. Carbon tetrachloride
13. Chlordane (technical mixture and metabolites)
14. Chlorinated benzenes (other than di-chlorobenzenes)
15. Chlorinated ethanes (including 1,2-di-chloroethane, 1,1,1-trichloroethane, and hexachloroethane)
16. Chloroalkyl ethers (chloroethyl and mixed ethers)
17. Chlorinated naphthalene
18. Chlorinated phenols (other than those listed elsewhere; includes trichlorophenols and chlorinated cresols)
19. Chloroform
20. 2-chlorophenol
21. Chromium and compounds
22. Copper and compounds
23. Cyanides
24. DDT and metabolites [1]
25. Dichlorobenzenes (1,2-, 1,3-, and 1,4-di-chlorobenzenes)
26. Dichlorobenzidine
27. Dichloroethylenes (1,1-, and 1,2-dichloroethylene)
28. 2,4-dichlorophenol
29. Dichloropropane and dichloropropene
30. 2,4-dimethylphenol
31. Dinitrotoluene
32. Diphenylhydrazine
33. Endosulfan and metabolites
34. Endrin and metabolites \1\
35. Ethylbenzene
36. Fluoranthene
37. Haloethers (other than those listed elsewhere; includes chlorophenylphenyl ethers, bromophenylphenyl ether, bis(dichloroisopropyl) ether, bis-(chloroethoxy) methane and polychlorinated diphenyl ethers)
38. Halomethanes (other than those listed elsewhere; includes methylene chloride, methylchloride, methylbromide, bromoform, dichlorobromomethane
39. Heptachlor and metabolites
40. Hexachlorobutadiene
41. Hexachlorocyclohexane
42. Hexachlorocyclopentadiene
43. Isophorone
44. Lead and compounds
45. Mercury and compounds
46. Naphthalene
47. Nickel and compounds
48. Nitrobenzene

49. Nitrophenols (including 2,4-dinitrophenol, dinitrocresol)
50. Nitrosamines
51. Pentachlorophenol
52. Phenol
53. Phthalate esters
54. Polychlorinated biphenyls (PCBs) [1]
55. Polynuclear aromatic hydrocarbons (including benzanthracenes, benzopyrenes, benzofluoranthene, chrysenes, dibenz-anthracenes, and indenopyrenes)
56. Selenium and compounds
57. Silver and compounds
58. 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD)
59. Tetrachloroethylene
60. Thallium and compounds
61. Toluene
62. Toxaphene [1]
63. Trichloroethylene
64. Vinyl chloride
65. Zinc and compounds

[1] Effluent standard promulgated (40 CFR 129).
[2] The term compounds shall include organic and inorganic compounds.

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Appendix B:
Use or Disposal of Sewage Sludge: Land Application
(40 CFR 503.13(b)(1) through 503.13(b)(4), and 503.16, Table 1)

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Use or Disposal of Sewage Sludge: Land Application
(40 CFR 503.13(b) and 503.16, Table 1)

Table 1:
Pollutant Concentrations for Sludge
(40 CFR 503.513(b)(3), Table 3)

Pollutant	Monthly Average Concentrations (mg/kg, dry weight basis)
Arsenic	41
Cadmium	39
Copper	1500
Lead	300
Mercury	17
Nickel	420
Selenium	36
Zinc	2800

Table 2:
Cumulative Pollutant Loading Rates for Sludge
(40 CFR 503.513(b)(2), Table 2)

Pollutant	Cumulative Pollutant Loading Rate (kg/hectare)
Arsenic	41
Cadmium	39
Copper	1500
Lead	300
Mercury	17
Nickel	420
Selenium	100
Zinc	2800

Table 3:
Ceiling Concentrations for Sludge
(40 CFR 503.513(b)(1), Table 1)

Pollutant	Ceiling Concentration (mg/kg, dry weight basis)
Arsenic	75
Cadmium	85
Copper	4300
Lead	840
Mercury	57
Molybdenum	75
Nickel	420
Selenium	100
Zinc	7500

Table 4:
Annual Pollutant Loading Rates
(40 CFR 503.513(b)(4), Table 4)

Pollutant	Annual Pollutant Loading Rates (kg/hectare/365-day period)
Arsenic	2.0
Cadmium	1.9
Copper	75
Lead	15
Mercury	0.85
Nickel	21
Selenium	5.0
Zinc	140

Table 5:
Frequency of Monitoring - Land Application and Surface Disposal
(40 CFR 503.16, Table 1)

Amount of sewage sludge[*] (metric tons/365 day period)	**Frequency**
Greater than zero but less than 290	Once per year
Equal to or greater than 290 but less than 1500	Once per quarter (four times per year)
Equal to or greater than 1500 but less than 15,000	Once per 60 days (six times per year
Equal to or greater than 15,000	Once per month (12 times per year)

[*] Either the amount of bulk sewage sludge applied to the land or the amount of sewage sludge received by a person who prepares sewage sludge that is sold or given away in a bag or other container for application to the land (dry weight basis).

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Appendix C:
Use or Disposal of Sewage Sludge:
Surface Disposal and Incineration
(40 CFR 503.23, Table 2; 503.26, Table 1; 503.46, Table 1)

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Use or Disposal of Sewage Sludge: Surface Disposal and Incineration
(40 CFR 503.23, Table 2; 503.26, Table 1; 503.46, Table 1)

Table 1:
Pollutant Concentrations for an Active Sewage Sludge Unit: Surface Disposal
(40 CFR 503.23, Table 2)

Unit Boundary to Property Site Distance *(meters)	Pollutant Concentration [1]		
	Arsenic mg/kg	Chromium mg/kg	Nickel mg/kg
0 to less than 25	30	200	210
25 to less than 50	34	220	240
50 to less than 75	39	260	270
75 to less than 100	46	300	320
100 to less than 125	53	360	390
125 to less than 150	62	450	420

[1] Dry weight basis

Table 2:
Frequency of Monitoring - Surface Disposal and Incineration
(40 CFR 503.26, Table 1 and 503.46, Table 1)

Amount of sewage sludge* (metric tons/365 day period)	Frequency
Greater than zero but less than 290	Once per year
Equal to or greater than 290 but less than 1500	Once per quarter (four times per year)
Equal to or greater than 1500 but less than 15,000	Once per 60 days (six times per year
Equal to or greater than 15,000	Once per month (12 times per year)

* Either the amount of bulk sewage sludge applied to the land or the amount of sewage sludge received by a person who prepares sewage sludge that is sold or given away in a bag or other container for application to the land (dry weight basis).

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Protocol for Conducting Environmental Compliance Audits of Municipal Facilities under EPA's Wastewater Regulations

Appendix D:
User Satisfaction Questionnaire and Comment Form

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User Satisfaction Survey
(OMB Approval No. 1860.01)
Expires 9/30/2001

We would like to know if this Audit Protocol provides you with useful information. This information will be used by EPA to measure the success of this tool in providing compliance assistance and to determine future applications and needs for regulatory checklists and auditing materials.

1. Please indicate which Protocol(s) this survey applies to:

   Title:____

   EPA Document Number:____

2. Overall, did you find the Protocol helpful for conducting audits:

   Yes ___ No___

   If not, what areas of the document are difficult to understand?

3. How would you rate the usefulness of the Protocol(s) for conducting compliance audits on a scale of 1-5?

   1 = not useful or effective, 3 = somewhat useful/effective, 5 = very useful/effective

Low		Medium		High	
1	2	3	4	5	Introduction Section
1	2	3	4	5	Key Compliance Requirements
1	2	3	4	5	Key Terms and Definitions
1	2	3	4	5	Checklist

4. What actions do you intend to take as a result of using the protocol and/or conducting the audit? Please check all that apply.

   ____ Contact a regulatory agency
   ____ Contact a compliance assisstance provider (e.g., trade association, state agency, EPA)
   ____ Contact a vendor
   ____ Disclose violations discovered during the audit under EPA's audit Policy
   ____ Disclose violations discovered under EPA's Small Business Policy
   ____ Obtain a permit or certification
   ____ Change the handling of a waste, emission or pollutant
   ____ Change a process or practice
   ____ Purchase new process equipment
   ____ Install emission control equipment (e.g., scrubbers, wastewater treatment)
   ____ Install waste treatment system (control technique)
   ____ Implement or improve pollution prevention practices (e.g., source reduction, recycling)
   ____ Improve organizational auditing program
   ____ Institute an Environmental Management System
   ____ Improve the existing Environmental Management System (e.g., improve training, clarify standard operating procedures, etc.)
   ____ Other ____

5. What, if any, environmental improvements will result from the actions to be taken (check all that apply)?

____ reduced emissions
____ waste reduction
____ reduced risk to human health and the environment due to better management practices
____ reduced quantity and toxicity of raw materials
____ water conservation
____ energy conservation
____ conserved raw materials
____ conservation of habitat or other environmental stewardship practice: ______________________
____ other: _______________________________________
____ no environmental improvements are likely to result from the use of this document

6. How did you hear about this document?
____ trade association
____ state technical assistance provider
____ EPA internet homepage or website
____ document catalog
____ co-worker or business associate
____ EPA, state, or local regulator
____ other (please specify) ___________________________

7. In order to understand your response, we would like to know what function you perform with respect to environmental compliance and the size of your organization.

____ Company Personnel
____ Environmental Auditor
____ Corporate Level
____ Plant-level
____ Legal
____ Environmental Manager
____ Operator - (e.g., Pollution Control Equipment
____ Other: _______________
____

____ Trade Association
____ National
____ Regional
____ Local
____ Manager
____ Information Specialist

____ Compliance Assistance Provider
____ EPA
____ State
____ State Small Business Assistance
____ Local
____ Other ______________
____

____ Regulatory Personnel
____ State
____ Local
____ EPA

____ Vendor/Consultant
____ Environmental Auditor
____ Environmental Engineer/Scientist
____ Attorney

8. How many employees are located at your facility (including full-time contractors?)

___ 0 - 9 ___ 10 - 49 ___ 50 - 100 ___ 101-500 ___ More than 500

Optional (Please Print)

Name: ______________________________Address:_____________________________

Title:________________________________City:_________________State:_________

Zip code:___________

Organization Name:____

Phone: (__)____________________E-mail:____________________________________

Please return all pages (1 thru 3) of this survey by folding pages 1 and 2 into page 3 and using the preprinted, pre-stamped address on the reverse side of page 3. If you have accessed this document electronically from one of EPA's web sites, simply e-mail this questionnaire to: satterfield.richard@epa.gov.

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Best Practices for Creating High Performance Healing Environments™

Version 2.0 *Pilot*

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Convener

Sponsors

GREEN GUIDE for Health Care™

A best practices guide for healthy and sustainable building design, construction and operations

Version 2.0 *Pilot*
November 2004

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www.gghc.org

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"The Green Guide for Health Care is a superb resource. It helps the leaders and managers of health care institutions "walk the talk," promoting the health of patients, visitors, employees, community members, and the global community, while operating economically and efficiently. I hope that every medical center, hospital, and clinic in the nation gets a copy of the Green Guide, takes its lessons to heart, and joins the growing movement toward better healthier environments in the health care sector."

Howard Frumkin, M.D., Dr.P.H., FACP, FACOEM
Professor and Chair
Department of Environmental and Occupational Health
Rollins School of Public Health of Emory University
Professor of Medicine, Emory Medical School
November 2004

Objectives

Welcome to ***Green Guide for Health Care™***, the health care sector's first quantifiable sustainable design toolkit integrating enhanced environmental and health principles and practices into the planning, design, construction, operations and maintenance of their facilities. This Guide provides the health care sector with a voluntary, self-certifying metric toolkit of best practices that designers, owners, and operators can use to guide and evaluate their progress towards high performance healing environments.

Health care facilities present both a challenge and opportunity in the development and implementation of sustainable design, construction and operations practices. Issues such as 24/7 operations, energy and water use intensity, chemical use, infection control requirements and formidable regulatory requirements can pose significant obstacles to the implementation of currently accepted sustainability protocols. Furthermore, it is appropriate that guidelines customized for the health care sector reflect the collective fundamental mission to protect and enhance individual and community health, and that those guidelines acknowledge the intrinsic relationship between the built environment and ecological health. As health care institutions evolve a design language for high performance healing environments, they have the opportunity to highlight the associated health-based benefits. This in turn can inspire the broader adoption of health-based design principles in other building sectors.

This document is neither intended to establish regulatory requirements, nor to be viewed as a minimum standard for design, construction or operations. Rather it is designed to serve as a voluntary educational guide for early adopters of sustainable design, construction, and operations practices, to encourage continuous improvement in the health care sector, and to provide market signals to catalyze a richer palette of strategies for those who follow the early adopters. As the general level of green building practice rises, it is anticipated that the *Guide* will be updated to encourage continued leadership and higher levels of rigor associated with creating high performance healing environments.

Updates and Information

This document is available for download at **www.gghc.org**.

This is an evolving document that will be updated as new information and guidance is gleaned from the Pilot program. If you did not download this document from the GGHC website, ***it is important that you register*** at **www.gghc.org** to ensure that you will be notified of updates as this document progresses.

Please contact **admin@gghc.org** for further information about document use and opportunities to support it.

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Using this Guide

Applicable Building Types

While an array of building types are represented in the health care sector, the *Green Guide for Health Care* is specifically customized for buildings that are predominately institutional occupancies as defined by the local building code, such as acute care hospitals, where regulatory requirements have created particular needs. Medical office buildings, clinics and other buildings where health care concerns are dominant can also use the *Guide*. Recognizing the full-range of construction, operations and maintenance activities associated with the health care sector, the *Guide* applies to new freestanding facilities, additions to existing facilities coupled with renovation, extensive rehabilitation/adaptive reuse projects, and existing facilities for which the *Operations* section can be used as a stand-alone best practices guide.

Credit Structure

The *Green Guide for Health Care* borrows the credit numbering scheme and credit outline structure of the U.S. Green Building Council (USGBC) LEED® family of products, by agreement, with some modifications. Each credit has the following elements:

- **Intent** – summarizes the goal of the credit.
- **Health Issues** – (new to the *Guide*) identifies specific health concerns addressed by the credit. Reviewed by Dr. Ted Schettler, M.D., MPH.
- **Credit Goals** – itemizes the specific steps to achieve the credit including threshold goals.
- **Documentation** – suggests documentation to monitor and baseline performance and benchmark achievement of the requirements. These represent the type of requirements that could be used in a LEED® style certification system. The *Guide*, however, is a voluntary self-certifying document. The GGHC Steering Committee has no intention of establishing a third party certification system. Hence it is at the user's discretion that appropriate record keeping and tracking systems are developed to internally monitor achievement of *Green Guide* goals.

  Note that while the suggested documentation requirements in *Green Guide for Health Care: Construction* can be completed by the end of construction, some of the strategies in the *Operations* section require collection of up to a year's data to determine credit achievement. Furthermore, while these operational data requirements are especially geared for existing facilities, they are also intended to serve as useful references for new construction projects as they establish operations policies and ongoing operational protocols.
- **Reference Standards** – references the standards and documents that form the basis of the credit requirements.
- **Potential Technologies & Strategies** – suggests optional pathways for meeting the credit intent. Regional considerations and project specific performance needs, goals and other constraints are important factors to consider. Products and materials referenced in the Potential Technologies & Strategies section do not represent an endorsement but rather a suggestion for consideration in some applications.
- **References** – cites selected references providing further information on the credit, requirements, and suggested technologies and strategies.

Points & Achievement Levels

The *Green Guide for Health Care* 2.0 Pilot does not currently provide achievement level threshold rankings. The 2.0 Pilot will be used to determine appropriate achievement thresholds based on review of a representative sampling of pilot projects. Thus, during the early pilot phase, achievement will be indicated by number of points tallied along with fulfillment of all prerequisites (e.g., Project X attained 65 GGHC Construction points and 38 Operations points).

Existing facilities are encouraged to track their ongoing performance using the *Operations* section, while making a commitment to utilize the *Construction* section on future projects.

Construction projects cannot actually attain some of the points in the *Operations* section as some of them require a year's worth of data to achieve credit goals. These projects are encouraged to identify the Operations-related credits that they intend to achieve and establish commitments to these O&M goals through policy setting.

Integrating Operations

Operations and maintenance protocols are critical to maintaining the health and environmental profile of health care facilities once built, and should be considered during programming and design phases. In acknowledging this relationship, the *Green Guide for Health Care* addresses some of the key operations issues in the accompanying *Operations* section. Given the critical relationship between operations, building program and design, design teams are strongly encouraged to collaborate with facility staff early in the design process to establish commitments to sustainable operations policies included in the *Operations* section, and evaluate the impact of these protocols, during programming and design to ensure their integration.

Participating in the Pilot

The *Green Guide for Health Care Pilot Phase* will run for a minimum of one year. Design and facility management teams in any stage of design, construction or operation are invited to register their projects and participate in the Pilot program. Participants will be able to engage in the *Green Guide for Health Care* Forum – a dedicated web-based discussion where registered project team members can engage in peer-to-peer interchanges with other teams to discuss issues that arise and exchange ideas as they pursue achievement of credits in the *Guide*. While the GGHC Steering Committee and staff are unable to offer consultation on individual projects, the peer-to-peer discussions in this Forum should provide valuable support and ideas to participants. These discussions will also provide important experiential data to the GGHC Steering Committee and inform subsequent refinements to the *Guide*. Register your project and your team at the Green Guide for Health Care web site (www.gghc.org) to participate.

Relationship to LEED® Products

The *Green Guide for Health Care* has been informed by a number of important guidance documents that have preceded it. See the Reference Documents section below for access to these key documents.

The organizational structure on which the *Guide* is based has been borrowed by agreement from the U.S. Green Building Council's Leadership in Energy and Environmental Design Green Building Rating System® (LEED®). The *Guide* is not a LEED® Rating System and not a product of the U.S. Green Building Council. The LEED structure was largely mirrored in the *Guide* because it is a familiar and effective tool being used by a rapidly growing sector of the building design, construction, operations and maintenance industries.

For many credits, the *Green Guide for Health Care* directly incorporates the language of the parallel LEED credit, referencing LEED's New Construction, Existing Buildings and Commercial Interiors products. In some cases, existing LEED credits have been modified to respond to the unique needs and concerns of health care facilities. In others, new credits have been added beyond those in current LEED products. The Credit Summary provides more information on the source of credits. The *Guide* primarily follows the language in LEED-NC v.2.1. The Steering Committee is incorporating appropriate, health care relevant LEED-NC v.2.2 and LEED-EB language as it becomes available. In general, the *Guide* builds on the LEED family of products by addressing the particular structural, usage, and regulatory challenges of health care buildings and by emphasizing the environmental and public health issues that comprise an important part of what it means for a health care institution to address sustainability in their building portfolio.

Development History

The initiation of health care focused sustainable design tools began with the **Green Healthcare Construction Guidance Statement** published by the American Society for Healthcare Engineering (ASHE) in January 2002, representing the first sustainable design guidance document to emphasize a health-based approach.

The *Green Guide for Health Care* development initiative began in March 2003 with a professionally and geographically diverse group of green health care industry leaders convened as an independent Steering Committee to guide the document development (see the Steering Committee list). Working Groups for each section of the document drafted credit language that was reviewed and approved by the Steering Committee as a whole.

In December, 2003, Version 1.0 of the *Green Guidelines for Healthcare Construction* was released in draft form for public comment. More than 900 registrants downloaded the document during the public comment period from organizations representing a broad range of architectural, engineering, construction, health care, and manufacturing firms and industry associations. Between December 2003 and the close of the comment period on February 29, 2004, almost 1,200 public comments were received. A partial listing of those who submitted comments is included further in this Introduction. The Steering Committee reviewed all public comments prior to the drafting of Version 2.0.

In November 2004, Version 2.0 of the *Green Guide for Health Care* was released for general use in the Pilot phase.

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Decision Making Process

The *Green Guide for Health Care* committee process is structured to include representation from a wide range of stakeholders and interests to ensure consistency and rigor in the document's development. Steering Committee membership, however, precludes organizations with direct financial interests in the products or certification services addressed by the document. Furthermore, this document is intended to be a best practices guide, not a basis for industry code or regulatory standard. For these reasons, the document is not intended to meet the legal definition of an industry "consensus based" standard.

Levels of Support

The Green Guide for Health Care welcomes support of its continued efforts through several options: *Supporters*, *Partners*, and *Endorsers*. Supporters, Partners and Endorsers affirm the intent and principles of the document (see the ASHE Green Healthcare Construction Guidance Statement - Statement of Principles) while not expressly endorsing every strategy or credit.

Sponsors provide a one time $10,000 minimum donation. Sponsors' logos are displayed on the GGHC website home page, on the title page of the *Guide* and in the Supporters section of the document and the GGHC website. The Supporters' section listing includes a brief one sentence description of the Sponsor.

Partners provide a one time $5,000 minimum donation or equivalent in-kind contribution, including organizational support for an active Steering Committee member or other significant contributor to the *Guide*. Partners are listed in the Supporters section of the document and the website and may, at their option, have their logo displayed on the Partners page of the GGHC website.

Endorsers agree to support the principles of the *Guide* and indicate their intent to use and promote the *Guide* within their organization or company. No direct financial or in-kind commitment is required to sign on as an Endorser. Endorsers are listed in the Supporters section of the document and on the GGHC website, which will be periodically updated.

Potential Partners are reviewed by the co-coordinators of the Guide. Sponsors are approved by the Steering Committee. Partner and Sponsor status is open to the following organizations:

- Design and Construction Firms
- Government Agencies
- Health Care Organizations/ Hospital Systems
- Insurers
- Non-Profit Organizations
- Professional Associations
- Private Foundations

To avoid potential conflicts of interest, manufacturers and their trade associations and product certifiers are ineligible for Sponsor or Partner status. All organizations and companies are welcome to support the *Guide* as Endorsers.

Contact **info@gghc.org** for further information about opportunities to support the GGHC.

Product Endorsement

The *Green Guide for Health Care* does not endorse products nor does it recommend for or against the purchase of specific products. In some instances, the *Guide* references product types that may be useful to address credit goals, considering price competitiveness, regulatory requirements, performance standards, and environmental/health impacts.

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Green Guide Supporters

Convener:

The *Green Guide for Health Care* is convened by the **Center for Maximum Potential Building Systems**, a non-profit design firm established in 1975, engaged in life cycle design to foster ecological balance and actively pursues interdisciplinary collaborations with a common vision of healthful environments, economic prosperity, and social equity.

Sponsors:

The *Green Guide for Health Care* is currently sponsored by:

Hospitals for a Healthy Environment (**H2E)** - the joint pollution prevention project of the **American Hospital Association**, the **U.S. Environmental Protection Agency**, **Health Care Without Harm**, and the **American Nurses Association**.

The **Merck Family Fund -** A private foundation that seeks to restore and protect the natural environment and ensure a healthy planet for generations to come while strengthening the social fabric and the physical landscape of the urban community.

The **New York State Energy Research & Development Authority (NYSERDA) –** A public benefit corporation formed to use innovation and technology to solve some of New York's most difficult energy and environmental problems in ways that improve the State's economy.

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Partners

The following organizations have provided critical direct or in-kind support to the development of the *Guide*:

American Society for Healthcare Engineering (ASHE), Chong Partners Architecture, CJL Engineering, Consorta, U.S. Environmental Protection Agency's ENERGY STAR® program, Guenther5 Architects, Guttmann & Blaevoet, Healthy Building Network, Health Care Without Harm, Institute for a Sustainable Future, Kaiser Permanente, Mazzetti & Associates, Stantec Engineering, TLC Engineering, Tufts - New England Medical Center, Turner Construction Company, and WHR Architects.

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Public Comment Period

During the Pubic Comment period from December 1, 2003 to February 29, 2004, over 900 people downloaded the *Guide.* More than 70 people submitted comments totaling almost 1200 entries. The comments received were broad reaching and constructive, ranging from probing critiques to enthusiastic endorsement. The Steering Committee has worked diligently to address the comments yielding a markedly improved 2.0 Pilot.

The following is a partial list of commenters who granted permission to publish their names. We list these individuals to acknowledge their contribution of ideas and efforts to the process. Listing here does not imply any endorsement by these individuals or their employers of the *Green Guide for Health Care.*

Kai Abelkis, Boulder Community Hospital

Carol Antle, Kaiser Permanente

Stephen Ashkin, The Ashkin Group

Phil Bailey

David Bearg, PE

Kenneth Bland, American Forest & Paper Association

Henning Bloech, Greenguard Environmental Institute

Janet Brown, Hospitals for a Healthy Environment

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Christie Coffin, The Design Partnership

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Ray Pradinuk, Stantec Architecture Ltd

Lynn Preston, C&A Floorcoverings

Sharon Refvem, Hawley Peterson & Snyder Architects

Phillip Risner, Seton Network Facilities

John Roberts, IES Engineers

Nick Stark and Ellen Godson, H.H. Angus & Associates

Jessica Stuart, Chlorine Chemistry Council

Patrice Sutton, California Department of Health Services

Peter Syrett AIA, Guenther 5 Architects PLLC

Kirk Teske, HKS, Inc.

Mark West, Earl Swensson Associates

Ronald Wilkinson, Dome-Tech Commissioning Services

Pier-George Zanoni, State of Michigan Dept of Community Health Facilities

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Reference Documents

The documents listed below have informed the overall development and content of the *Green Guide for Health Care*, though are not specifically referenced in the **Resources** sections associated with individual credits:

- **Green Healthcare Construction Guidance Statement**
  American Society for Healthcare Engineering
  http://www.gghc.org/documents/ASHEGreenConstructionGuidance2002-A.pdf
- **LEED-NC®**(Leadership in Energy and Environmental Design)
  Green Building Rating System for New Construction
  Version 2.1 by the U.S. Green Building Council (USGBC)
  http://www.usgbc.org/leed
- **LEED-EB®** Green Building Rating System for Existing Buildings
  Version 2 by the U.S. Green Building Council
  http://www.usgbc.org/leed
- **LEED-CI®** Green Building Rating System for Commercial Interiors
  Pilot Version by the U.S. Green Building Council
  http://www.usgbc.org/leed
- **Labs 21 Environmental Performance Criteria (EPC)**
  Laboratories for the 21st Century, U.S. Environmental Protection Agency
  http://www.labs21century.gov/
- **Green Star** Green Building Rating System
  Green Building Council of Australia
  http://www.gbcaus.org/greenstar
- **High Performance Building Guidelines**
  New York City Department of Design and Construction, Office of Sustainable Design
  http://www.ci.nyc.ny.us/html/ddc/html/ddcgreen/
- **2003 Savings By Design Healthcare Modeling Procedures**
  Pacific Gas and Electric Company
  http://www.gghc.org/Documents/PGEModProc.pdf
- **Greener Hospitals: Improving Environmental Performance**,
  Edited by: Environment Science Center, Augsburg, Germany with support of Bristol-Myers Squibb
  www.wzu.uni-augsburg.de/Publikationen/WZU_Publikationsreihe.html

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Green Healthcare Construction Guidance Statement (2001)

Statement of Principles

The construction and use of buildings in the U.S. consumes 3 billion tons of raw materials annually (40% of raw stone, gravel, sand, and steel, 25% of virgin wood, 40% of energy resources, 75% of PVC, 17% of freshwater flows) and generates significant waste (25-40% of municipal solid waste from construction and demolition alone), 50% of CFCs, 30% of CO2 production, and substantial toxic emissions.

Given this, the opportunities are significant to improve environmental quality through green planning, design, construction and operations and maintenance practices. Improving the environment through green construction practices is consistent with the American Hospital Association's recent voluntary agreement with the United States Environmental Protection Agency to reduce waste volume and toxicity.

Building design and construction practice can be shaped to protect health at three scales:

1) Protecting the immediate health of building occupants

The health of patients, staff, and visitors can be profoundly affected by the quality of the indoor air which in turn is dependent upon physical and mechanical design (such as ventilation and location of wastes and toxics), the choice of building materials, the management of construction emissions, and building operations and maintenance. Additionally, access to daylighting has been found to favorably affect staff productivity and patient outcomes.

2) Protecting the health of the surrounding community

Local air and water quality is also significantly affected by building design choices. Off-gassing building materials and finishes, construction equipment and HVAC systems directly emit VOCs, particulates and other materials that can result in the formation of ground level ozone (smog), and cause allergic attacks, respiratory problems and other illnesses. Land use and transportation planning, landscape and water management on the grounds and water conservation efforts within the building will influence the amount of toxic emissions released to the water and air throughout the life of the building.

3) Protecting the health of the global community and natural resources

The health impact of a building stretches far beyond its immediate community. The production of building materials can result in the release of persistent bioaccumulative toxic compounds, carcinogens, endocrine disruptors and other toxic substances. These compounds threaten communities where the materials are manufactured, and, because of the long life of some of these compounds, can risk the health of communities and ecosystems far from their release.

Climate change resulting from burning fossil fuels is expected to increase the spread of disease vectors far from their current regions and destabilize ecosystems, threatening worldwide nutrition. Loss of rainforests from unsustainable forestry can result in the loss of medicines and important genetic information that could help fight disease. Moreover, release of CFCs and HCFCs damages the stratospheric ozone layer, allowing increased levels of ultraviolet rays on Earth resulting in heightened potential for skin cancer.

The Importance of Prevention

Prevention is a fundamental principle of health care and public health. Indeed, to prevent disease is preferable to treating disease after it has occurred. In the face of uncertainty, precautionary action is appropriate to prevent harm. This public health approach makes sense both in the clinical setting and in responses to environmental and public health hazards. Similarly, a precautionary and preventive approach is an appropriate basis for decisions regarding material selection, design features, mechanical systems, infrastructure, and operations and maintenance practices.

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For reference to the full ASHE Construction Guidance Statement, refer to the Reference Documents section above.

Construction

Y - (yes) you are moderately confident that you can attain the credit.
? - (maybe) it will be challenging for this project and you are uncertain of your ability to attain it but you will try.
N - (no) while technically possible, you currently don't expect to try to achieve this credit in this project due to cost or other tradeoffs with project goals.
NA - (not applicable) it is inherently physically unattainable for this particular project regardless of effort due to physical conditions or project scope.

Integrated Design

Y				Prereq 1	Integrated Design Process	Required
Y				Prereq 2	Environmental Health Mission Statement & Program	Required

Sustainable Sites — 18 Points

Y				Prereq 1	Erosion & Sedimentation Control	Required
Y	?	N	NA	Credit 1	Site Selection	1
Y	?	N	NA	Credit 2	Development Density	1
Y	?	N	NA	Credit 3.1	Brownfield Redevelopment: Basic Remediation Level	1
Y	?	N	NA	Credit 3.2	Brownfield Redevelopment: Residential Remediation Level	1
Y	?	N	NA	Credit 4.1	Alternative Transportation: Public Transportation Access	1
Y	?	N	NA	Credit 4.2	Alternative Transportation: Bicycle Storage & Changing Rooms	1
Y	?	N	NA	Credit 4.3	Alternative Transportation: Alternative Fuel Vehicles	1
Y	?	N	NA	Credit 4.4	Alternative Transportation: Parking Capacity	1
Y	?	N	NA	Credit 5.1	Reduced Site Disturbance: Protect or Restore Open Space	1
Y	?	N	NA	Credit 5.2	Reduced Site Disturbance: Development Footprint	1
Y	?	N	NA	Credit 6.1	Stormwater Management: Rate & Quantity	1
Y	?	N	NA	Credit 6.2	Stormwater Management: Treatment	1
Y	?	N	NA	Credit 7.1	Heat Island Effect: Non-Roof	1
Y	?	N	NA	Credit 7.2	Heat Island Effect: Roof	1
Y	?	N	NA	Credit 8	Light Pollution Reduction	1
Y	?	N	NA	Credit 9	Connection to the Natural World: Places of Respite	1
Y	?	N	NA	Credit 10.1	Community Contaminant Prevention: Airborne Releases	1
Y	?	N	NA	Credit 10.2	Community Contaminant Prevention: Leaks & Spills	1

Water Efficiency — 7 Points

Y				Prereq 1	Potable Water Use for Equipment Cooling	Required
Y	?	N	NA	Credit 1.1	Water Efficient Landscaping: Reduce Potable Water Use by 50%	1
Y	?	N	NA	Credit 1.2	Water Efficient Landscaping: No Potable Water Use or No Irrigation	1
Y	?	N	NA	Credit 2	Innovative Wastewater Technologies	1
Y	?	N	NA	Credit 3.1	Domestic Potable Water Use Reduction: 20%	1
Y	?	N	NA	Credit 3.2	Domestic Potable Water Use Reduction: 30%	1
Y	?	N	NA	Credit 4.1	Process Water Use Reduction: Measurement & Verification	1
Y	?	N	NA	Credit 4.2	Process Water Use Reduction: No or Low Water Use Building System Equipment	1

Energy & Atmosphere — 19 Points

Y				Prereq 1	Fundamental Building Systems Commissioning	Required
Y				Prereq 2	Minimum Energy Performance	Required
Y				Prereq 3	CFC Reduction in HVAC&R Equipment	Required
Y	?	N	NA	Credit 1.1	Optimize Energy Performance: 5%	1
Y	?	N	NA	Credit 1.2	Optimize Energy Performance: 10%	1
Y	?	N	NA	Credit 1.3	Optimize Energy Performance: 15%	1
Y	?	N	NA	Credit 1.4	Optimize Energy Performance: 20%	1
Y	?	N	NA	Credit 1.5	Optimize Energy Performance: 25%	1
Y	?	N	NA	Credit 1.6	Optimize Energy Performance: 30%	1
Y	?	N	NA	Credit 1.7	Optimize Energy Performance: 35%	1
Y	?	N	NA	Credit 1.8	Optimize Energy Performance: 40%	1
Y	?	N	NA	Credit 2.1	Renewable Energy: 1%	1
Y	?	N	NA	Credit 2.2	Renewable Energy: 2%	1
Y	?	N	NA	Credit 2.3	Renewable Energy: 5%	1
Y	?	N	NA	Credit 3	Additional Commissioning	1
Y	?	N	NA	Credit 4	Refrigerant Selection	1
Y	?	N	NA	Credit 5	Measurement & Verification	1
Y	?	N	NA	Credit 6.1	Energy Supply Efficiency. 10%	1
Y	?	N	NA	Credit 6.2	Energy Supply Efficiency. 15%	1
Y	?	N	NA	Credit 6.3	Energy Supply Efficiency. 17%	1
Y	?	N	NA	Credit 6.4	Energy Supply Efficiency. 18%	1
Y	?	N	NA	Credit 7	Medical Equipment Efficiency	1

Materials & Resources — 24 Points

Y				Prereq 1	Storage & Collection of Recyclables	Required
Y				Prereq 2	Mercury Elimination	Required
Y	?	N	NA	Credit 1.1	Building Reuse: Maintain 40% of Existing Walls, Floors & Roof	1
Y	?	N	NA	Credit 1.2	Building Reuse: Maintain 80% of Existing Walls, Floors & Roof	1
Y	?	N	NA	Credit 1.3	Building Reuse: Maintain 50% of Interior Non-Structural Elements	1
Y	?	N	NA	Credit 2.1	Construction Waste Management: Divert 50% from Landfill & Incineration	1
Y	?	N	NA	Credit 2.2	Construction Waste Management: Divert 75% from Landfill & Incineration	1
Y	?	N	NA	Credit 2.3	Construction Practices: Site & Materials Management	1
Y	?	N	NA	Credit 2.4	Construction Practices: Utility & Emissions Control	1
Y	?	N	NA	Credit 3.1	Resource Reuse 5%	1
Y	?	N	NA	Credit 3.2	Resource Reuse 10%	1
Y	?	N	NA	Credit 4.1	Recycled Content: 10%	1
Y	?	N	NA	Credit 4.2	Recycled Content: 20%	1
Y	?	N	NA	Credit 5.1	Regional Materials: 10%	1
Y	?	N	NA	Credit 5.2	Regional Materials: 20%	1
Y	?	N	NA	Credit 6	Rapidly Renewable Materials: 5%	1
Y	?	N	NA	Credit 7	Certified Wood	1
Y	?	N	NA	Credit 8.1	PBT Elimination: Dioxins	1
Y	?	N	NA	Credit 8.2	PBT Elimination: Mercury Use in Equipment	1
Y	?	N	NA	Credit 8.3	PBT Elimination: Lead & Cadmium	1

Materials & Resources continued

Y	?	N	NA	Credit 9.1	Furniture & Medical Furnishings: Resource Reuse	1
Y	?	N	NA	Credit 9.2	Furniture & Medical Furnishings: Materials	1
Y	?	N	NA	Credit 9.3	Furniture & Medical Furnishings: Manufacturing, Transportation & Recycling	1
Y	?	N	NA	Credit 10	Copper Reduction	1
Y	?	N	NA	Credit 11.1	Resource Use: Design for Flexibility	1
Y	?	N	NA	Credit 11.2	Resource Use: Minimize Materials	1

Environmental Quality — 24 Points

Y	Prereq 1	Minimum IAQ Performance	Required
Y	Prereq 2	Asbestos Removal or Encapsulation	Required

Y	?	N	NA	Credit 1	Air Quality Monitoring	1
Y	?	N	NA	Credit 2	Increase Ventilation Effectiveness	1
Y	?	N	NA	Credit 3.1	Construction IAQ Management Plan: During Construction	1
Y	?	N	NA	Credit 3.2	Construction IAQ Management Plan: Before Occupancy	1
Y	?	N	NA	Credit 4.1	Low-Emitting Materials: Interior Adhesives & Sealants	1
Y	?	N	NA	Credit 4.2	Low-Emitting Materials: Wall & Ceiling Finishes	1
Y	?	N	NA	Credit 4.3	Low-Emitting Materials: Flooring Systems	1
Y	?	N	NA	Credit 4.4	Low-Emitting Materials: Composite Wood & Insulation	1
Y	?	N	NA	Credit 4.5	Low-Emitting Materials: Furniture & Medical Furnishings	1
Y	?	N	NA	Credit 4.6	Low-Emitting Materials: Exterior Applied Products	1
Y	?	N	NA	Credit 5.1	Chemical & Pollutant Source Control: Outdoor	1
Y	?	N	NA	Credit 5.2	Chemical & Pollutant Source Control: Indoor	1
Y	?	N	NA	Credit 6.1	Controllability of Systems: Lighting	1
Y	?	N	NA	Credit 6.2	Controllability of Systems: Thermal & Ventilation	1
Y	?	N	NA	Credit 7	Continuous Comfort Monitoring System	1
Y	?	N	NA	Credit 8.1a	Daylight & Views: Daylight for Occupied Spaces: 34-48% flr w/in 15’	1
Y	?	N	NA	Credit 8.1b	Daylight & Views: Daylight for Occupied Spaces: 38-56% flr w/in 15’	1
Y	?	N	NA	Credit 8.1c	Daylight & Views: Daylight for Occupied Spaces: 42-64% flr w/in 15’	1
Y	?	N	NA	Credit 8.1d	Daylight & Views: Daylight for Occupied Spaces: 90% access to daylight	1
Y	?	N	NA	Credit 8.1e	Daylight & Views: Daylight for Occupied Spaces: 2% DF for 75% of staff	1
Y	?	N	NA	Credit 8.2	Daylight & Views: Building Orientation	1
Y	?	N	NA	Credit 8.3	Daylight & Views: Views for Occupied Spaces	1
Y	?	N	NA	Credit 8.4	Daylight & Views: Lighting & Circadian Rhythm	1
Y	?	N	NA	Credit 9	Acoustic Environment	1

Innovation in Design — 4 Points

Y	?	N	Credit 1.1	Innovation in Design:	1
Y	?	N	Credit 1.2	Innovation in Design	1
Y	?	N	Credit 1.3	Innovation in Design	1
Y	?	N	Credit 1.4	Innovation in Design	1

Construction Project Total — 96 Points

Operations

Integrated Operations — 5 Points

Y				Prereq 1	Integrated Operations & Maintenance Process	Required
Y				Prereq 2	Recertification Process	Required
Y				Prereq 3	Environmental Tobacco Smoke Control	Required
Y				Prereq 4	Outside Air Introduction & Exhaust Systems	Required
Y	?	N	NA	Credit 1.1	Building Operations & Maintenance: Staff Education	1
Y	?	N	NA	Credit 1.2	Building Operations & Maintenance: Building Systems Maintenance	1
Y	?	N	NA	Credit 1.3	Building Operations & Maintenance: Building Systems Monitoring added "s" to Oper	1
Y	?	N	NA	Credit 2.1	IAQ Management: Maintaining Indoor Air Quality	1
Y	?	N	NA	Credit 2.2	IAQ Management: Reduce Particulates in Air Distribution	1

Transportation Operations — 3 Points

Y	?	N	NA	Credit 1.1	Alternative Transportation: Public Transit Access	1
Y	?	N	NA	Credit 1.2	Alternative Transportation: Low Emitting & Fuel Efficient Vehicles	1
Y	?	N	NA	Credit 1.3	Alternative Transportation: Car Pool Programs	1

Energy Efficiency — 18 Points

Y				Prereq 1	Existing Building Commissioning	Required
Y				Prereq 2	Minimum Energy Performance	Required
Y				Prereq 3	Ozone Protection	Required
Y	?	N	NA	Credit 1.1	Optimize Energy Performance: Energy Star score of 63	1
Y	?	N	NA	Credit 1.2	Optimize Energy Performance: Energy Star score of 67	1
Y	?	N	NA	Credit 1.3	Optimize Energy Performance: Energy Star score of 71	1
Y	?	N	NA	Credit 1.4	Optimize Energy Performance: Energy Star score of 75	1
Y	?	N	NA	Credit 1.5	Optimize Energy Performance: Energy Star score of 79	1
Y	?	N	NA	Credit 1.6	Optimize Energy Performance: Energy Star score of 83	1
Y	?	N	NA	Credit 1.7	Optimize Energy Performance: Energy Star score of 87	1
Y	?	N	NA	Credit 1.8	Optimize Energy Performance: Energy Star score of 91	1
Y	?	N	NA	Credit 1.9	Optimize Energy Performance: Energy Star score of 95	1
Y	?	N	NA	Credit 1.10	Optimize Energy Performance: Energy Star score of 99	1
Y	?	N	NA	Credit 2.1	On-Site & Off-Site Renewable Energy: 1% on or 5% off	1
Y	?	N	NA	Credit 2.2	On-Site & Off-Site Renewable Energy: 2% on or 10% off	1
Y	?	N	NA	Credit 2.3	On-Site & Off-Site Renewable Energy: 5% on or 25% off	1
Y	?	N	NA	Credit 2.4	On-Site & Off-Site Renewable Energy: 10% on or 50% off	1
Y	?	N	NA	Credit 3	Energy Efficient Equipment	1
Y	?	N	NA	Credit 4	Refrigerant Selection	1
Y	?	N	NA	Credit 5.1	Performance Measurement: Enhanced Metering	1
Y	?	N	NA	Credit 5.2	Performance Measurement: Emission Reduction Reporting	1

Water Conservation — 8 Points

Y				Prereq 1	Minimum Water Efficiency	Required
Y	?	N	NA	Credit 1.1	Water Efficient Landscaping: Reduce potable water use by 50%	1
Y	?	N	NA	Credit 1.2	Water Efficient Landscaping: Eliminate potable water use	1
Y	?	N	NA	Credit 2.1	Building Water Use Reduction: Reduce fixture use by 10%	1
Y	?	N	NA	Credit 2.2	Building Water Use Reduction: Reduce fixture use by 20%	1
Y	?	N	NA	Credit 3.1	Process Water Efficiency : Reduce 20%	1
Y	?	N	NA	Credit 3.2	Process Water Efficiency : Reduce 30%	1
Y	?	N	NA	Credit 3.3	Process Water Efficiency : Reduce 40%	1
Y	?	N	NA	Credit 4	Enhanced Metering	1

Chemical Management — 5 Points

Y				Prereq 1	Polychlorinated Biphenyl (PCB) Removal	Required
Y	?	N	NA	Credit 1.1	Community Contaminant Prevention: Airborne Releases	1
Y	?	N	NA	Credit 1.2	Community Contaminant Prevention: Leaks & Spills	1
Y	?	N	NA	Credit 2	Indoor Pollutant Source Control: High Hazard Chemicals	1
Y	?	N	NA	Credit 3.1	Chemical Discharge: Chemical Waste Minimization Plan	1
Y	?	N	NA	Credit 3.2	Chemical Discharge: Pharmaceutical Waste Discharge	1

Waste Management — 6 Points

Y				Prereq 1	Waste Stream Audit	Required
Y	?	N	NA	Credit 1.1	Total Waste Reduction: 30%	1
Y	?	N	NA	Credit 1.2	Total Waste Reduction: 40%	1
Y	?	N	NA	Credit 1.3	Total Waste Reduction: 50%	1
Y	?	N	NA	Credit 2.1	Regulated Medical Waste Reduction: <10%	1
Y	?	N	NA	Credit 2.2	Regulated Medical Waste Reduction: Minimize incineration	1
Y	?	N	NA	Credit 3	Food Waste Reduction	1

Environmental Services — 9 Points

Y	?	N	NA	Credit 1.1	Outdoor Grounds & Building Exterior Management : 4 items	1
Y	?	N	NA	Credit 1.2	Outdoor Grounds & Building Exterior Management : 4 more	1
Y	?	N	NA	Credit 2	Indoor Integrated Pest Management	2
Y	?	N	NA	Credit 3	Environmentally Preferable Cleaning Policy	1
Y	?	N	NA	Credit 4.1	Sustainable Cleaning Products & Materials: 30% of annual purchases	1
Y	?	N	NA	Credit 4.2	Sustainable Cleaning Products & Materials: 60% of annual purchases	1
Y	?	N	NA	Credit 4.3	Sustainable Cleaning Products & Materials: 90% of annual purchases	1
Y	?	N	NA	Credit 5	Environmentally Preferable Janitorial Equipment	1

Environmentally Preferable Purchasing — 11 Points

Y	?	N	NA	Credit 1.1	Food: Organic or Sustainable	1
Y	?	N	NA	Credit 1.2	Food: Antibiotics	1
Y	?	N	NA	Credit 1.3	Food: Local Production / Food Security	1
Y	?	N	NA	Credit 2	Janitorial Paper & Other Disposable Products	1
Y	?	N	NA	Credit 3	Electronics Purchasing & Take Back	1
Y	?	N	NA	Credit 4.1	Toxic Reduction: Mercury	1
Y	?	N	NA	Credit 4.2	Toxic Reduction: DEHP	1
Y	?	N	NA	Credit 4.3	Toxic Reduction: Natural Rubber Latex	1
Y	?	N	NA	Credit 5	Furniture & Medical Furnishings	1
Y	?	N	NA	Credit 6.1	IAQ Compliant Products: 45% of annual purchases	1
Y	?	N	NA	Credit 6.2	IAQ Compliant Products: 90% of annual purchases	1

Innovation in Operation — 7 Points

Y	?	N	Credit 1.1	Innovation in Operation	1
Y	?	N	Credit 1.2	Innovation in Operation	1
Y	?	N	Credit 1.3	Innovation in Operation	1
Y	?	N	Credit 1.4	Innovation in Operation	1
Y	?	N	Credit 2	Documenting Sustainable Operations Business Case Impacts	1
Y	?	N	Credit 3.1	Documenting Productivity Impacts: Absenteeism & Healthcare Costs	1
Y	?	N	Credit 3.2	Documenting Productivity Impacts: Other Productivity Impacts	1

Operations Project Totals — 72 Points

Key
Y - (yes) you are moderately confident that you can attain the credit.
? - (maybe) it will be challenging for this project and you are uncertain of your ability to attain it but you will try.
N - (no) while technically possible, you currently don't expect to try to achieve this credit in this project due to cost or other tradeoffs with project goals.
NA - (not applicable) it is inherently physically unattainable for this particular project regardless of effort due to physical conditions or project scope.
Examples would include: Credits SS 3.1 & 3.2 (Brownfield redevelopment) for a project not on a brownfield site, MR Credits 1.1 - 1.3 (Building reuse) if no portions of an existing building are part of the project, EQ Credit 8.1, 4th 7 5th points (Daylight & Views: inpatient) if there are no facilities for inpatients, and SS Credit 7.1 & 2 (Heat island effect) if the scope of the project is only interior renovation

Credit Summary

This section summarizes the intent and goals of credits in the Construction and Operations sections.

The Source column indicates the relationship of the base credit language to the LEED® system:
LEED = credit language is as per LEED-NC® 2.1 or LEED-EB®
Mod = credit language is modified from LEED by the GGHC Steering Committee**.
New = credit is new to the GGHC, not in LEED

Both the Green Guide Construction and Operations section combine some strategies found in LEED products with new credits. Many of the borrowed credits have been modified by the GGHC Steering Committee, and fulfillment of the modified credits may or may not meet the requirements of LEED. The user must review the appropriate LEED documents to determine potential LEED status of a project.

The Construction section borrows heavily from LEED-NC 2.1 and maintains the same organizing structure and numbering.

The Operations section borrows a number of strategies found in LEED products – both LEED-EB and LEED-NC - as well as in ISO 14001 Certification standards with some strategies that are new to the Guide. Because the Green Guide Operations section structure does not follow LEED category structure, the user is advised to carefully review each document for corresponding credit language.

Construction

Integrated Design

Title	*Intent*	*Credit Goals*	*Source*
ID Prereq 1 Integrated Design	Achieve an effective collaborative design process and outcome by engaging the multiple design disciplines, as well as users, constructors, facility managers and operations personnel.	Use cross discipline design and decision making starting early in the process & continuing throughout to take advantage of interrelationships between systems. Include representation early on in the design process from all end user stakeholders, including owners, physician teams, nursing, administrators, support services, housekeeping staff, and engineering/maintenance personnel.	New
ID Prereq 2 Environmental Health Mission Statement & Program	Establish environmental health goals and use as a basis for selection and implementation of building design, construction, and operational strategies.	Prepare an environmental health mission statement and program to complement the facility's functional design program. This environmental health program shall be retained by the facility with the other design data to assure that future alterations, additions, and program changes are consistent with the intent of the environmental health program.	New

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Sustainable Sites

Title	*Intent*	*Credit Goals*	*Source*
SS PreReq 1 Erosion & Sedimentation Control	Control erosion to reduce negative impacts on water and air quality.	Develop a site sediment and erosion control plan, specific to the site, that conforms to United States Environmental Protection Agency (EPA) Document No. EPA-832R-92-005 (September 1992), Storm Water Management for Construction Activities, Chapter 3, OR local erosion and sedimentation control standards and codes, whichever is more stringent.	LEED
SS 1 Site Selection	Avoid development of inappropriate sites and reduce the environmental impact from the location of a building on a site.	Do not develop buildings, roads or parking areas on portions of sites that meet any one of the following criteria: prime farmland, land whose elevation is lower than 5 feet above the elevation of the 100-year flood, land which is specifically identified as habitat for any species on the Federal or State threatened or endangered lists, land within 100 feet of any water including wetlands isolated wetlands or areas of special concern identified by state or local rule, land which prior to acquisition for the project was public parkland, unless land of equal or greater value as parkland is accepted in trade by the public landowner	LEED
SS 2 Development Density	Channel development to urban areas with existing infrastructures, protect greenfields and preserve habitat and natural resources. In rural areas, increase development density on existing or previously developed sites rather than undeveloped rural land.	Increase localized density to conform to governmental density goals by utilizing sites that are located within an existing minimum development density of 80,000 square feet per acre (two story downtown development), OR For previously developed rural sites, increase density of the existing site to a minimum development density of 30,000 square feet per acre.	Mod
SS 3.1 Brownfield Redevelopment : Basic Remediation Level	Rehabilitate damaged sites where development is complicated by real or perceived environmental contamination, reducing pressure on undeveloped land.	Develop on a site documented as contaminated OR on a site classified as a brownfield by a local, state or federal government agency. Effectively remediate site contamination.	LEED
SS 3.2 Brownfield Redevelopment : Residential Remediation Level		Same as 3.1 and remediate the site to the residential level as defined by the EPA Region 9 Preliminary Remediation Guidelines. Verify that the site is not within 2000 feet of another site documented as contaminated OR a site classified as a brownfield by a local, state, or federal government agency, unless remediated to the residential level.	New
SS 4.1 Public Transportation Access	Reduce pollution and land development impacts from automobile use.	Locate the building entrance within 1/2 mile of a commuter rail, light rail or subway station or 1/4 mile of two or more public or campus bus lines usable by building occupants.	LEED
SS 4.2 Bicycle Storage & Changing Rooms	Reduce pollution and land development impacts from automobile use.	Provide secure bicycle storage with convenient changing/shower facilities (within 200 yards of the building) for 3% or more of peak building day shift staff. Provide one shower per 8 cyclists. (Staff shower facilities within building may be counted.)	Mod
SS 4.3 Alternative Fuel Vehicles	Reduce pollution from local emissions of fossil-fuel combustion powered vehicles.	Provide preferred parking and fueling stations for a 100% alternative fuel fleet if that fleet comprises a minimum of 50% of total fleet mileage driven annually, OR Install alternative-fuel refueling station(s) for 3% of the total vehicle parking capacity of the site, OR Provide preferred parking programs for hybrid or alternative fuel vehicles for at least 10% of the total vehicle parking capacity.	Mod
SS 4.4 Parking Capacity	Reduce pollution and land development impacts from single occupancy vehicle use.	Size parking capacity to meet, but not exceed, minimum local zoning requirements OR health department regulatory authority, whichever is the overriding requirement, AND provide preferred parking for carpools or vanpools capable of serving 5% of the total building staff AND Limit overall open-air paved vehicular circulation and parking area to 350 sf/stall.	Mod

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Title	*Intent*	*Credit Goals*	*Source*
SS 5.1 Reduced Site Disturbance: Protect or Restore Open Space	Conserve, preserve, and enhance existing natural areas and restore damaged areas to provide habitat for native flora and fauna and promote biodiversity.	On greenfield sites, limit site disturbance to 40 feet beyond the building perimeter, 15 feet beyond primary roadway curbs, 8 feet beyond walkways, 10 feet from the centerline of main utility trenches, and 10 feet beyond constructed areas with permeable surfaces that require additional staging areas. Protect and encourage the development of native vegetation, OR On previously developed sites, restore a minimum of 50% of the site area (excluding the building footprint) by replacing impervious surfaces with emphasis on native species and limited use of adapted non-invasive species.	Mod
SS 5.2 Reduced Site Disturbance: Development Footprint		Reduce the development footprint (entire building footprint, access roads and parking) so that open space on the site exceeds the local zoning requirement by 25%. For areas with no local zoning requirements, dedicate open space area adjacent to the building that is equal to the development footprint.	LEED
SS 6.1 Stormwater Management: Rate & Quantity	Limit disruption to channel stability and pollution of natural water flows by implementing a channel protection strategy.	If existing imperviousness is ≤ 50%, establish a stormwater management plan that protects downstream channel stability using a recognized channel protection strategy to prevent the post-development 2 year, 24 hour peak discharge rate from exceeding the pre-development rate, OR If existing imperviousness is > 50%, establish a stormwater management plan that results in a 25% decrease in the rate and quantity of runoff from the 1-year 24-hour design storm.	Mod
SS 6.2 Stormwater Management: Treatment		Establish a stormwater treatment systems plan that maintains annual groundwater recharge rates by promoting nonstructural practices and infiltration and captures and treats the runoff volume from either 90% of the average annual rainfall or 1" (2.54 cm) of rainfall.	Mod
SS 7.1 Heat Island Effect: Non-Roof	Reduce heat islands to minimize impact on microclimate and human and wildlife habitat.	Provide shade (within 5 years) and/or use light-colored, high-albedo and/or open grid pavement with a Solar Reflectance Index (SRI) of at least 30 for at least 30% of the site's hardscape.	Mod
SS 7.2 Heat-Island: Roof		Use Energy Star® compliant (highly reflective) AND high emissivity roofing (emissivity of at least 0.9 when tested in accordance with ASTM 408) roofing having a Solar Reflectance Index (SRI) as required in Table 2 for a minimum of 75% of the roof surface, OR Install a "green" (vegetated) roof for at least 50% of the roof area. Combinations of high albedo SRI roof and vegetated roof can be used.	Mod
SS 8 Light Pollution Reduction	Eliminate light trespass from the building and site, improve night sky access, and reduce development impact on nocturnal environments.	Meet light levels and uniformity ratios recommended by the Illuminating Engineering Society of North America (IESNA) *Recommended Practice Manual: Lighting for Exterior Environments* (RP-33-99). Design exterior lighting such that all exterior luminaires with more than 1000 initial lamp lumens are shielded and all luminaires with more than 3500 initial lamp lumens meet the Full Cutoff IESNA Classification. Assure that the maximum candela value of all interior lighting falls within the building (not out through windows) and of all exterior lighting falls within the property. Assure that any luminaire within a distance of 2.5 times its mounting height from the property boundary has shielding such that no light from that luminaire crosses the property boundary. Zone and control lights to allow for limiting night-time lighting to the Emergency Department, a small employee parking area, a small visitor parking area, pedestrian walkways, and circulation routes.	Mod
SS 9 Connection to the Natural World: Places of Respite	Provide places of respite on the health care campus to connect health care patients, visitors, and staff to the natural environment.	Establish 5% of the net usable program area as specifically programmed places of respite with direct connection to the natural environment for patients, visitors, and staff. Provide at least one place of respite dedicated to staff and separate from patients and visitors. Provide at least one outdoor place of respite conveniently located and easily accessible and identifiable to patients and visitors and at least one outdoor place of respite dedicated to staff designated as non-smoking.	New
SS 10.1 Community Contaminant Prevention: Airborne Releases	Minimize building airborne effluents and environments, safety, and health impacts to site and neighbors.	Exceed by 10% the NIH-CDC Guidelines for Airborne Effluent from Laboratories that Handle Biohazards. Meet all standards of California South Coast Air Quality Management District for all products of combustion.	New (EPC)
SS 10.2 Community Contaminant Prevention: Leaks & Spills	Prevent releases of hazardous chemicals and fuels to storm sewer.	Establish oil interceptors at all drains from parking areas and central plant areas. Comply with California Health & Safety Code Section 25290.1 and 25291 for the installation of fuel oil storage tanks to prevent release of diesel fuels.	New (EPC)

Water Efficiency

Title	Intent	Credit Goals	Source
WE Prereq 1 Potable Water Use for Equipment Cooling	Eliminate potable water use for equipment cooling.	Do not use potable water for once through cooling for any equipment. (Does not apply to potable water for cooling tower makeup, or for other evaporative cooling systems; refer to Credit 4 for Process Water.)	New
WE 1.1 Water Efficient Landscaping: Reduce Potable Water Use by 50%	Limit or eliminate the use of potable water for landscape irrigation.	Reduce potable water consumption from irrigation by at least 50% over conventional means. Landscaped area must include a minimum of one-half acre outside of the building. Do not use water from wells or rivers for site irrigation purposes.	Mod
WE 1.2 Water Efficient Landscaping: No Potable Water Use or No Irrigation		Use only captured rain or recycled site water to eliminate all potable water consumption for site irrigation (except for initial watering to establish plants). Landscaped area must include a minimum of one-half acre outside of the building. Do not use water from wells or rivers for site irrigation purposes. OR Do not install permanent landscape irrigation systems.	Mod
WE 2 Innovative Wastewater Technologies	Reduce generation of wastewater and potable water demand, while increasing the local aquifer recharge.	Reduce the use of municipally provided potable water for building sewage conveyance by a minimum of 50%, OR Treat 100% of wastewater on-site to tertiary standards.	LEED
WE 3.1 & 3.2 Domestic Potable Water Use Reduction	Maximize potable water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems.	Credit 3.1 - Employ strategies that in aggregate use 20% less water than the water use baseline calculated for the building after meeting the Energy Policy Act of 1992 fixture performance requirements.	LEED
		Credit 3.2 - Employ strategies that in aggregate use 30% less water than the water use baseline.	LEED
WE 4.1 Process Water Use Reduction: Measurement & Verification	Provide for the ongoing accountability and optimization of building water consumption performance over time.	Provide for long term continuous measurement of potable water uses within the facility. Provide individual meters for the following water uses (as applicable to the project): laboratory, dietary department, central sterile and processing department, laundry, radiology and imaging department, surgical suite, purified water system and filter backwash water, outdoor irrigation systems, cooling tower make-up and filter backwash water, steam boiler system make-up water, and closed loop hydronic system make-up water.	New
WE 4.2 Process Water Use Reduction: Low or No Water Use Building System Equipment	Reduce or eliminate the use of potable water for non-potable process use in building system equipment.	Use building system equipment (pumps, compressors, cooling towers, etc.) that reduce the use of potable water by at least 10% in comparison to that of comparable equipment that use potable water for a process use. Minimum water savings must be at least 100,000 gallons annually.	New

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Energy & Atmosphere

Title	Intent	Credit Goals	Source
EA Prereq 1 Fundamental Building Systems Commissioning	Verify and ensure that fundamental building elements and systems are designed, installed and calibrated to operate as intended.	Establish or have a contract in place to establish the following best practice commissioning procedures: Engage a commissioning team that does not include individuals directly responsible for project design or construction management. Review the design intent and the basis of design documentation. Incorporate commissioning goals into the construction documents. Develop and utilize a commissioning plan. Verify installation, functional performance, training and operation and maintenance documentation. Complete a commissioning report.	LEED
EA Prereq 2 Minimum Energy Performance	Establish the minimum level of energy efficiency for the base building and systems.	Model anticipated energy performance using DOE2.1E or Energy Plus. Design to meet or exceed ASHRAE/IESNA 90.1-2004 of local energy, whichever is stricter unless regulatory requirements exempt facility from portions of the code in which case meet or exceed baseline defined in the credit, AND Create an estimate of whole building energy consumption as defined in the credit and determine the Energy Performance Rating using EPA's Target Finder rating tool and submit.	Mod
EA Prereq 3 CFC Reduction in HVAC&R Equipment	Reduce ozone depletion.	Zero use of CFC-based refrigerants in new base building HVAC&R systems. When reusing existing base building HVAC equipment that currently uses CFC refrigerants, create and implement a comprehensive CFC phase-out plan.	LEED
EA 1 Optimize Energy Performance	To achieve increasing levels of energy performance to reduce environmental impacts associated with excessive energy use.	Model anticipated energy performance using DOE2.1E or Energy Plus and compare to baseline as defined in EA Prerequisite 2. For healthcare buildings exempt from ASHRAE 90.1, document through modeling, a reduction in energy consumption of the proposed design when compared to the baseline design. For others document a reduction in energy cost budget as per ASHRAE 90.1	Mod
		Credit 1.1 Reduce design energy consumption by 5%/ cost by 10%	
		Credit 1.2 Reduce design energy consumption by 10%/cost by 15%	
		Credit 1.3 Reduce design energy consumption by 15% / cost by 20%	
		Credit 1.4 Reduce design energy consumption by 20% / cost by 25%	
		Credit 1.5 Reduce design energy consumption by 25% / cost by 30%	
		Credit 1.6 Reduce design energy consumption by 30% / energy cost by 35%	
		Credit 1.7 Reduce design energy consumption by 35% / energy cost by 40%	
		Credit1.8 Reduce design energy consumption by 40% / energy cost by 45%	
EA 2 Renewable Energy	Encourage use of renewable energy technologies to reduce fossil fuel energy use.	Supply a net fraction of the building's total energy use with on-site renewable energy sources.	Mod
		Credit 2.1 Renewable energy, 1% contribution	
		Credit 2.2 Renewable energy, 2% contribution	
		Credit 2.3 Renewable energy, 5% contribution	
EA 3 Additional Commissioning	Verify and ensure that the entire building is designed, constructed and calibrated to operate as intended.	Contract with a commissioning authority independent of the design team to review: the design prior to the construction document phase; the construction documents near completion of the construction document development and prior to issuing the contract documents for construction; and the contractor submittals relative to systems being commissioned. Provide the Owner with a single manual that contains the information required for re-commissioning building systems. Have a contract in place to review building operation with O&M staff, including a plan for resolution of outstanding commissioning-related issues within one year after construction completion date.	LEED
EA 4 Refrigerant Selection	Reduce ozone depletion and global warming effects through the proper selection of refrigerants for use in chillers.	Install base building level HVAC and refrigeration equipment with combined low ozone depletion and global warming potential.	LEED (as per TSAC)
EA 5 Measurement & Verification	Provide for the ongoing accountability and optimization of building energy consumption performance over time.	Provide for long term continuous measurement of substantive energy and water uses within the facility. At a minimum, provide metering for the following electrical and mechanical systems (as applicable to the scope of the project): Lighting system power and controls Motor loads (including air compressors, vacuum pumps and boiler systems) Chillers and Air distribution systems Data Centers Critical Equipment Electrical Distribution Systems	Mod

Title	*Intent*	*Credit Goals*	*Source*
EA 6 Energy Supply Efficiency	Reduce the total non-renewable source energy required for the facility through increased energy supply efficiency.	Calculate the percentage reduction in the total annual non-renewable source energy, achieved through the use of combined heat and power systems, or other methods of cascading energy recovery of primary fuel supplies (commonly know as "cogeneration").	New
		Credit 6.1 Reduce source energy use by at least 10%	
		Credit 6.2 Reduce source energy use by at least 15%	
		Credit 6.3 Reduce source energy use by at least 17%	
		Credit 6.4 Reduce source energy use by at least 18%	
EA 7 Medical Equipment Efficiency	Reduce energy consumption by using efficient medical and other equipment.	Use Energy Star® qualified equipment or equipment in the top 25th percentile for energy consumption for that class of equipment for at least 75% (quantity, not cost) of the new medical equipment that is not building systems related.	New

Materials & Resources

Title	Intent	Credit Goals	Source
MR Prereq 1 Storage & Collection of Recyclables	Reduce solid waste disposal in landfills and incinerators through reduction, reuse, recycling and composting.	Establish a collection system and controlled areas serving the entire building dedicated to the separation, storage, and collection of materials for recycling including (at a minimum) newsprint, paper, corrugated cardboard, glass, plastics, metals, fluorescent lamps (tube, compact fluorescent and HID) and batteries.	Mod
MR Prereq 2 Mercury Elimination	Eliminate stand alone mercury-containing building products and reduce mercury discharge through product substitution and capture.	Eliminate thermostats, switches and other stand-alone mercury containing measurement devices in building control systems. Specify and install low mercury fluorescent tubes and compact fluorescent lamps, and low mercury high intensity discharge bulbs such that average mercury content in fluorescent tubes and compact fluorescent lamps does not exceed 5 mg of mercury, and that high intensity discharge lamps have the lowest available mercury content. Plan for capture of historical mercury sources in demolition. Collect mercury devices for recycling. In facilities delivering dental care, install amalgam separation devices.	New
MR 1 Building Reuse	Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and environmental impacts of manufacturing and transport of new building materials.	Credit 1.1 Use existing structure (including structural floor and roof decking) and envelope (exterior skin and framing, excluding window assemblies and non-structural roofing material) to comprise at least 40% of completed building (including additions).	Mod
		Credit 1.2 Use existing structure and envelope in an additional 40% (80% total) of existing building structure and shell.	Mod
		Credit 1.3 Reuse existing non-shell elements (interior walls, doors, floor coverings, and ceiling systems) in at least 50% of completed building (including additions).	Mod
MR 2.1 & 2.2 Construction Waste Management: Divert from Landfill & Incineration	Divert construction and demolition debris from disposal in landfills and incinerators. Redirect recyclable recovered resources back to manufacturing.	Develop and implement a waste management plan. Define process for surveying and assessing hazardous materials in the existing building. Recycle and/or salvage at least 50% of non-hazardous construction and demolition debris.	Mod
		Recycle and/or salvage an additional 25% (75% total) of non-hazardous construction and demolition debris.	
MR 2.3 Construction Practices: Site & Materials Management	Implement site and materials management practices during construction to minimize adverse impacts on adjacent occupants.	Construction Practices Environmental Management System (EMS): Develop and implement an EMS for construction & pre-occupancy phases of the building including the following:	New
		Site Utilization: Compile a site access plan to minimize site disruption associated with the project's construction phase. Develop measures to protect priority sensitive areas of the site.	
		Temporary Facilities: Utilize salvaged or refurbished materials for construction of temporary facilities, but avoid reuse of pressure treated lumber or lumber with lead paint. Make all temporary facilities weathertight.	
		Delivery, Storage and Handling: Coordinate delivery with scheduled installation date to minimize packaging, handling and storage time at site. Store materials in clean, dry location. Handle and store fuels to prevent spills and discharges into waterways. Store fuels, solvents and other sources of VOCs separately from absorbent materials. Implement proper disposal of waste materials.	
		Construction Site Housekeeping and Particulates Control: Control particulate discharge resulting from sandblasting operations. Use water sprinkling to control dust generation.	
		Environmental Manager: Designate an on-site party responsible for overseeing the environmental goals for the project.	
		Environmental Training Program: Provide environmental training for personnel performing work on the project site.	
MR 2.4 Construction Practices: Utility & Emissions Control	Reduce air & noise pollution from vehicle and construction equipment use during construction. Manage temp utilities efficiently.	Develop plan to reduce utility, vehicle and energy use, including: efficient lighting, controlled water use and runoff, high efficiency heating & cooling, weathertight enclosures, alternate fuel fleets, low-sulfur diesel, biodiesel or natural gas powered equipment, electric power equipment and carpooling. Reduce equipment related noise by complying with Blue Angel Criteria RAL-UZ-53 as consistent with performance requirements.	New
MR 3 Resource Reuse	Reuse building materials to reduce demand for virgin materials and to reduce waste.	Credit 3.1 Specify salvaged, refurbished or reused materials, products and furnishings for a minimum of 5% of the total value of all building materials and products used in the project.	LEED
		Credit 3.2 Specify at least another 5% (total 10% or greater) of the total value of all building materials and products used in the project.	

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Title	*Intent*	*Credit Goals*	*Source*
MR 4 Recycled Content	Increase demand for building products that use recycled content materials, reducing impacts from extraction and processing of virgin materials.	Credit 4.1 Specify materials with recycled content such that the sum of post-consumer recycled content plus 1/2 the post-industrial recycled content constitutes at least 10% of the total monetary value of the materials in the project. No fly ash or slag from plant co-fired with hazardous or medical waste or tire derived fuel. Credit 4.2 Specify an additional 10% (total 20% or greater) of the total monetary value of the materials in the project.	Mod
MR 5 Regional Materials	Increase demand for building materials and products that are extracted and manufactured within the region.	Credit 5.1 Specify a minimum of 10% (by cost) of building materials that are extracted, harvested or recovered, then processed and manufactured within a radius of 300 miles, OR that are extracted, harvested or recovered, then, processed, manufactured and shipped primarily by rail or water within a radius of 1,000 miles OR combination. Credit 5.2 Specify an additional 10% (total 20%)	Mod
MR 6 Rapidly Renewable Materials	Reduce the depletion of finite raw materials and long-cycle renewable materials.	Specify rapidly renewable building materials and products (planted and harvested within a ten-year cycle) for a minimum of 5% of the total value of all building materials and products used in the project.	LEED
MR 7 Certified Wood	Encourage environmentally responsible forest management.	Specify products certified in accordance with the Forest Stewardship Council's Principles and Criteria for a minimum of 50% of the total value of all wood-based materials and products used in the project.	LEED
MR 8.1 PBT Elimination: Dioxins	Reduce the release of persistent bioaccumulative toxic chemicals (PBTs) associated with the life cycle of building materials.	No use of cement from kilns fired with hazardous waste AND no use of materials containing virgin or recycled chlorinated compounds in 2 of 3 areas (Exterior and Structural, Interior Finishes, or Mechanical/Electrical Systems).	New
MR 8.2 PBT Elimination: Mercury		Specify HVAC systems, control systems, and other large electrical products and/or systems that are free of mercury switches and mercury relays.	New
MR 8.3 PBT Elimination: Lead & Cadmium		Specify substitutes for materials manufactured with lead and cadmium: Lead free solder, roofing and wiring. No use of paints containing cadmium or lead.	New
MR 9.1 Furniture & Medical Furnishings: Resource Reuse	Reduce the environmental impacts from the manufacture, use and disposal of furniture and medical furnishings products.	Specify salvaged, refurbished, or used furniture and medical furnishings for a minimum of 20% of the total furniture and medical furnishings budget.	New
MR 9.2 Furniture & Medical Furnishings: Materials		Specify 40% by cost of furniture and medical furnishings that comply with at least 2 of: - No PBTs in manufacture - Dioxin, Mercury, Cadmium, Lead or chlorinated compounds in furniture components, textiles, finishes or dyes. - No chrome plated finish. - FSC Certified Wood components in manufacture (per MR Credit 7).	
MR 9.3 Furniture & Medical Furnishings: Manufacturing, Transportation & Recycling		Specify 40% (by cost) of furniture and medical furnishings that comply with a minimum of two (2) of the following goals - Locally and/or regionally assembled – within 300 miles, if transported by truck and with 1000 miles if transported by rail or water. - Transported with minimum packaging – reusable, compostable or recyclable. - Has "end of life" destination – is designed for disassembly, recyclability, biodegradability, or is part of a "take back" program.	
MR 10 Copper Reduction	Prevent copper-contaminated run-off to aquatic systems.	Eliminate the use of copper roofing, gutters & cladding materials AND Specify and use ASTM B8133 flux and ASTM B828 joint technique when installing copper pipe to reduce copper pipe corrosion.	New
MR 11.1 Resource Use: Design for Flexibility	Conserve resources associated with the construction and management of buildings by designing for flexibility and ease of future adaptation, and minimizing initial resource use.	Increase building flexibility and ease of adaptive reuse over the life of the structure by employing one (1) or more of the following design and/or space planning strategies such as: modular planning grids, use of interstitial spaces, development of flexible "technology floors" for diagnostic and treatment facilities to facilitate ease of modifications for changing major equipment	New
MR 11.2 Resource Use: Minimize Materials		Minimize raw material usage of the structure over its life cycle by one or both of: demountable and modular building systems or components for partitions, raised floor distribution systems, or the like, comprising a minimum of 5% of the total value of the building component. In the case of modular casework, such casework must comprise 50% of the total combined value of casework and custom millwork, OR Demonstrate construction systems and/or strategies that require less material by utilizing shell elements as finish materials where appropriate (such as exposed ceilings, polished concrete floors, or exposed structure), that reduce total material usage by 5%	New

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Environmental Quality

Title	*Intent*	*Credit Goals*	*Source*
EQ Prereq 1 Minimum IAQ Performance	Establish minimum IAQ performance to prevent the development of indoor air quality problems.	Meet the minimum requirements of voluntary consensus standard ASHRAE 62-2001, Ventilation for Acceptable Indoor Air Quality, and Addenda. Mechanical systems shall be designed using the Ventilation Rate Procedure.	LEED
EQ Prereq 2 Asbestos Removal or Encapsulation	Reduce the potential exposure of building occupants to asbestos.	Comply with EPA's asbestos removal, encapsulation and management regulations under NESHAP 40 CFR 61. Remove potentially friable materials in ventilation distribution plenums and chases per OSHA 29 CFR Part 1926. Identify all asbestos containing materials that may be affected by proposed construction activities.	New
EQ 1 Air Quality Monitoring	Provide capacity for indoor air quality (IAQ) monitoring to help sustain long-term occupant comfort and well-being.	For density ≥ 25 people per 1000sf, provide CO2 sensor and compare with outdoor ambient CO2 and generate alarm for 15% above ASHRAE Standard 62 concentrations. For other spaces monitor, control and alarm to maintain outdoor airflow within 15% of design minimum.	Mod
EQ 2 Increase Ventilation Effectiveness	Provide for the effective delivery and mixing of fresh air to support the safety, comfort and well-being of building occupants.	For mechanically ventilated buildings, design ventilation systems that result in an air change effectiveness (Eac) ≥ 0.9 as determined by ASHRAE 129-1997. For naturally ventilated spaces demonstrate a distribution and laminar flow pattern that involves ≥ 90% of the room or zone area in flow direction. Up to 25% of total building area may be excluded where a) air distribution design is mandated and/or restricted by code or in b) unoccupied spaces (such as storage and mechanical areas) or in c) spaces with no supply distribution.	Mod
EQ 3.1 Construction IAQ Management Plan: During Construction	Prevent indoor air quality problems resulting from the construction or renovation process to sustain the comfort and well-being of construction workers and building occupants.	Develop and implement an Indoor Air Quality (IAQ) Management Plan for the construction and pre-occupancy phases of the building: - In occupied buildings, seal the construction site with deck-to-deck partitions and maintain negative pressure throughout the entire construction process. Contain and exhaust construction process odors to protect occupied areas. - Use filtration media with a MERV of 8 at each return air grill. Replace all filtration media immediately prior to occupancy. - Meet or exceed the recommended Design Approaches of the SMACNA IAQ Guideline for Occupied Buildings Under Construction, 1995, Chapters 3 & 4. - Manage the site in conjunction with the Infection Control Risk Assessment (ICRA) procedures from JCAHO Environment of Care Standard (EC.3.2.1). Protect absorptive materials from moisture damage while they are stored on-site and after they are installed. Immediately remove, dispose of and replace any materials with stains, mold, mildew or other evidence of water damage & replace with new, undamaged materials. - Sequence construction procedures to avoid exposing absorbent materials to VOCs from wet application materials. - Use IPM. Control dust, paint fumes, tobacco smoke and noise.	Mod
EQ 3.2 Construction IAQ Management Plan: Before Occupancy	Reduce indoor air quality problems resulting from the construction or renovation process to sustain the comfort and well-being of construction workers and building occupants.	Develop and implement an Indoor Air Quality (IAQ) Management Plan for the pre-occupancy phase of the building as follows: After construction ends and prior to occupancy conduct a minimum two week building flush-out with new filtration media at 100% outside air. After the flushout, replace the filtration media with new filtration media OR After construction ends and prior to occupancy conduct a baseline indoor air quality testing procedure that demonstrates that the concentration levels for the chemical contaminants listed are not exceeded.	Mod
EQ 4.1 Low-Emitting Materials: Interior Adhesives & Sealants	Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.	Use only adhesives and sealants with volatile organic compound (VOC) content that does not exceed South Coast Air Quality Management District (SCAQMD) Rule #1168 and Bay Area Air Quality Management District (BAQMD) Regulation 8, Rule 51, except for flat sealants which must not exceed 50 grams/liter (SCAQMD 2008 level) and aerosol adhesives which must meet Green Seal Standard GC-36 requirements. Use only adhesives and sealants with no California Prop 65 carcinogen or reproductive toxicant components present at more than 1% of total mass.	Mod

Title	Intent	Credit Goals	Source
EQ 4.2 Low-Emitting Materials: Wall & Ceiling Finishes		Use only paints and coatings that comply with the most current version of the following standards: Green Seal Standard GS-11, Paints; Green Seal Standard GS-03, Anti-Corrosive Paints; South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, rules in effect for 1/1/2008; Bay Area Air Quality Management District (BAQMD) Regulation 8, Rule 3 When ceiling tiles and or wall coverings are used instead of paint, use only products that meet or exceed the indoor air quality requirements of California's Special Environmental Requirements, Specifications Section 01350, OR are certified by GreenGuard.	Mod
EQ 4.3 Low-Emitting Materials: Flooring Systems		Use only carpet and resilient flooring systems that meet or exceed the indoor air quality requirements of California's Special Environmental Requirements, Specifications Section 01350 OR The Carpet and Rug Institute (CRI) "Green Label Plus". Use only adhesives and sealants with no California Prop 65 carcinogen or reproductive toxicant components present at more than 1% of total mass of the product. Use only carpets with no natural rubber latex in the backing.	Mod
EQ 4.4 Low-Emitting Materials: Composite Wood and Insulation		Use composite wood, casework, fiberglass insulation and agrifiber products and adhesives used to fabricate laminated in field- and shop-fabricated assemblies containing these products with no added urea-formaldehyde resins.	Mod
EQ 4.5 Low-Emitting Materials: Furniture & Medical Furnishings	Reduce the use of furniture that may release indoor air contaminants that are odorous or potentially irritating and may be deleterious to installer and occupant health, comfort and well-being.	Select a minimum of 40% (by cost) of all furniture and medical furnishings (including mattresses, foams, panel fabrics and other textiles) that do not contain at least three of the following four materials: Polybrominated diphenyl ethers (PBDE), perfluorooctanoic acid (PFOA), urea formaldehyde, phthalate plasticizers; OR that do not contain at least two of the four listed materials and either: meet or exceed the indoor air quality requirements of California's Special Environmental Requirements, Specifications Section 01350, OR are certified by GreenGuard.	New
EQ 4.6 Low-Emitting Materials: Exterior Applied Products	Protect installers and building occupants and safeguard air quality resulting from exposure to hazardous and/or odorous substances used during construction.	Specify and use coatings, roofing and waterproofing materials that meet or are lower than the VOC limits of Bay Area Air Quality Management District Regulation 8, Rule 51 & Rule 3. Contain from occupied areas or eliminate through material selection, odors, and other emissions produced by outdoor construction processes (i.e., bituminous roofing and waterproofing). Comply with NIOSH Publication No. 2003-112: Asphalt Fume Exposures During the Application of Hot Asphalt to Roofs.	New
EQ 5.1 Chemical & Pollutant Source Control: Outdoor	Avoid exposure of building occupants to potentially hazardous outdoor soils and pollutants that adversely impact air quality and human health.	Design to minimize pollutant contamination of regularly occupied areas due to exterior factors with: textured paving for outside approaches, permanent entryway systems (grilles, grates, etc.) at all high volume entryways and removable entryway systems at all entrances with associated cleaning, maintenance and replacement strategies. Locate all HVAC equipment air intakes a minimum distance from the following sources and a minimum of 10 feet above finish grade: - minimum of 100' from helipads and 50' from loading docks, ambulance bays, and entrances where vehicles are arriving or leaving (and prohibit idling in these locations), from designated smoking areas, from vegetation/ landscape subject to pesticide/herbicide applications and from other potential sources of air contaminants.	Mod
EQ 5.2 Chemical & Pollutant Source Control: Indoor	Avoid exposure of building occupants to potentially hazardous indoor pollutants and chemicals that adversely impact air quality and human health.	Design to minimize pollutant cross-contamination of regularly occupied spaces: Where chemical use occurs (including soiled utility areas, sterilization areas, housekeeping areas and copier areas), provide segregated areas with deck to deck partitions with separate outside exhaust at a rate of at least 0.50 CFM per square foot, (for rooms containing disinfectant and sterilant applications, a minimum of 12 air changes/hour shall be provided), no air re-circulation and maintain a negative pressure compared with the surrounding spaces of at least an average of 5 Pa (0.02 inches of water gauge) and with a minimum of 1 Pa (0.004 inches of water) when the door(s) to the room(s) are closed. Provide regularly occupied areas of the building with new air filtration media prior to occupancy that provides a Minimum Efficiency Reporting Value (MERV) of 13 or better.	New

Title	*Intent*	*Credit Goals*	*Source*
EQ 6.1 Controllability of Systems: Lighting	Provide a high level of temperature and ventilation or lighting system control by individual occupants, or by specific groups in multi-occupant spaces.	Provide individual lighting controls for 90% of the building occupants. Automatic daylight dimming controls must be provided for permanently installed lighting that is 15 feet inside of and 2 feet to either side of all windows and 10 feet around skylights and 10 feet from the exterior face of clerestories.	Mod
EQ 6.2 Controllability of Systems: Thermal & Ventilation		Provide individual temperature and ventilation controls for 50% of the occupants. Operable windows can be used in lieu of individual controls for areas that are 20 feet inside of and 10 feet to either side of the operable part of the window. Areas of operable window must meet ASHRAE 62-2001, ¶5.1.	Mod
EQ 7 Continuous Thermal Monitoring System	Provide a thermally comfortable environment that supports the productivity and well-being of building occupants.	Provide a permanent monitoring system to ensure thermal comfort criteria as determined by EQ Prerequisite 4 Thermal Comfort – Compliance.	Mod
EQ 8.1 (5 points) Daylight & Views: Daylight for Occupied Spaces	Provide building occupants with a connection between indoor spaces and the outdoors by introducing daylight and views.	Design for 34-66% of total floor area within 15 ft of perimeter window or 2% daylight factor. (1-3 points) Inpatient Units: - Provide daylight access for 90% of patient and public spaces. (1 point) - Achieve 2% daylight factor for 75% of staff occupied areas. (1 point)	Mod
EQ 8.2 Daylight and Views: Building Orientation	Connect patients, visitors, and staff to the natural environment.	Assess the site and surrounding area and develop a master plan for incorporating ways of experiencing significant natural features (on-site and distant) into the overall site and building planning. Incorporate nature as an essential element of the building design in order to enhance the healing process.	Mod
EQ 8.3 Daylight and Views: Views from Occupied Spaces	Provide building occupants with a connection between indoor spaces and the outdoors by introducing daylight and views into the building's regularly occupied areas.	Establish direct line of sight to vision glazing for building occupants in 90% of all staff occupied areas including offices, corridors, nursing stations, break rooms, cafeterias, and lobbies. Areas directly connected to perimeter windows must have a glazing-to-floor area ratio of at least 0.07. Parts of the floor area with horizontal view angles of less than 10 degrees at 50 inches above the floor cannot be included in this calculation. End of corridor windows fulfill the requirement for unobstructed length of the corridor. Spaces not directly connected to perimeter windows must have a horizontal view angle of less than10 degrees at 50 inches above the floor involving 50% or more of the room area. If the room meets these requirements then the entire room area is considered to meet the view goal. Exceptions to the goals include diagnostic and treatment rooms (if controlled environment prohibits introduction of natural light), copy rooms, storage areas, utility rooms, mechanical, and laundry rooms.	Mod
EQ 8.4 Daylight & Views: Lighting and Circadian Rhythm	Improve alertness levels, work performance, staff satisfaction and health, and reduce medical errors, by providing lighting systems based on circadian rhythm.	Provide electric lighting systems and controls for patient areas and staff work areas based upon principles of circadian rhythm. In patient areas, provide lighting design solutions that allow for variation in day and night lighting characteristics. In staff areas, provide lighting to support work performance and alertness through both daytime and night lighting cycles. Implement a no-rotation work routine to be able to address the needs of the day and the night shift appropriately. Provide ambient and task lighting that is variable spectrum, and free of glare, and task oriented. Where daylight is not achievable, provide electric lighting systems that simulate daylight, brightness and diurnal variation, and allow individual and central lighting control systems. Circadian Rhythm is a self-sustained biological rhythm that in an organism's natural environment normally has the period of approximately 24 hours.	New
EQ 9 Acoustic Environment	Provide building occupants with a healing environment, free of disruptive levels of sound and vibration.	Specify materials, products, mechanical systems and design features to attenuate sound and vibration, and not to exceed Room Criteria (RC) ratings listed for Hospital and Clinics in Table 34 of Chapter 46, Sound and Vibration Control, 1999 ASHRAE Application Handbook. Select ceiling tiles with NRC>0.85 and CAC≥35 Test Sound Levels as a component of Building Commissioning.	New

Innovation in Design

Title	*Intent*	*Credit Goals*	*Source*
IN 1 Innovation in Operations	To provide project teams the opportunity to achieve points for exceptional performance above requirements set by the *Green Guide for Health Care: Operations* and/or innovative performance for green operations strategies not specifically addressed by the *Green Guide for Health Care*.	Identify the intent of the proposed innovation credit, the proposed requirement for compliance, the proposed documentation to demonstrate compliance, and the operational approach used to meet the required elements.	LEED-EB

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Operations

Integrated Operations

Title	*Intent*	*Credit Goals*	*Source*
IO Prereq 1 Integrated Operations & Maintenance Process	Demonstrate a cross discipline approach in Operations and Maintenance decision-making and implementation to ensure safe, healthful, environmentally sensitive methods and materials.	Demonstrate functional cross discipline process for decision-making regarding safe, healthful and environmentally sensitive operations and maintenance and encouraging continuous improvement.	New
IO Prereq 2 Recertification Process	Maintain the ongoing functional application of all design decisions & processes associated with the initial design certification.	Specify processes to monitor and document actual performance of each measure achieved in the initial design.	New
IO Prereq 3 Environmental Tobacco Smoke Control	Prevent exposure of building occupants and systems to Environmental Tobacco Smoke (ETS).	Prohibit smoking in the building. Locate any exterior designated smoking areas at least 50 feet away from entries, operable windows, air intakes, bus stops, disabled parking, and other locations where occupants could inadvertently come in contact with ETS when occupying, entering or leaving the building. Only for residential facilities where the functional program requires accommodation for smokers may there be an exception to establish negative pressure smoking rooms.	LEED-NC
IO Prereq 4 Outside Air Introduction & Exhaust Systems	Establish minimum indoor air quality (IAQ) performance to enhance indoor air quality in buildings, thus contributing to the health and well-being of the occupants.	Modify or maintain existing building outside-air (OA) ventilation distribution system to supply at least the outdoor air ventilation rate required by ASHRAE 62.1-2004. (ASHRAE 62.1.1-2001 with all Addenda can be used until ASHRAE 62.1-2004 is published.) Meet the EPA IAQ guidelines OR SMACNA IAQ guidelines for HVAC System Maintenance to ensure the proper operations and maintenance of HVAC components as they relate to IAQ. Test and maintain the operation of all building exhaust systems, including bathroom, utility areas, laboratories, kitchen and parking exhaust system.	MOD
IO 1.1 Building Operations & Maintenance: Staff Education	Support appropriate operations and maintenance of buildings and building systems to ensure they deliver target building performance goals over the life of the building.	Have in place over the performance period a building operations and maintenance staff education program that provides each staff person primarily working on building maintenance with at least 24 hours of education each year over the performance period on building and building systems operations, maintenance, and achieving sustainable building performance. Training must be of high quality and relevant to building operations and maintenance.	LEED-EB
IO 1.2 Building Systems Maintenance		Have in place over the performance period a comprehensive best practices equipment preventative maintenance program that provides in-house resources or contractual services to deliver post warranty maintenance.	LEED-EB
IO 1.3 Building Systems Monitoring		Have in place over the performance period a system for continuous tracking and optimization of systems that regulate indoor comfort and the conditions (temperature, humidity, and CO2) delivered in occupied spaces.	LEED-EB
IO 2.1 IAQ Management: Maintaining IAQ Performance	Enhance Indoor Air Quality (IAQ) performance by optimizing practices to prevent the development of indoor-air quality problems in buildings.	Establish an IAQ Compliance Program, as outlined in “A Guide to Managing Indoor Air Quality in Health Care Organizations”, Joint Commission on Accreditation of Healthcare Organizations, 1997. OR Develop and implement on an ongoing basis an IAQ management program for your building based on the USEPA document "Building Air Quality: A Guide for Building Owners and Facility Managers".	Mod
IO 2.2 Reduce Particulates in Air Distribution	Reduce exposure of building occupants and maintenance personnel to potentially hazardous particulate contaminants.	Have filters with particle removal effectiveness MERV 13 or greater in place over the performance period for all outside air intakes and for the returns for the re-circulation of inside air. Establish and follow a regular schedule for maintenance and replacement of these filters.	LEED-EB

Transportation Operations

Title	*Intent*	*Credit Goals*	*Source*
TO 1.1 Alternative Transportation: Public Transportation Access	Reduce pollution and land development impacts from single occupancy vehicle use.	Provide and maintain a building occupant conveyance program (shuttle-link) for buildings that are more than 1/2 mile from commuter rail or subway and 1/4 mile from established bus routes.	LEED-NC
TO 1.2 Alternative Transportation: Low Emitting and Fuel Efficient Vehicles		Own or lease an alternative fuel vehicle fleet, using any combination of the acceptable fuel types, and comprising a minimum of 50% of total flee mileage driven annually. Provide fueling stations for 100% of alternative fuel fleet, and preferred parking for such fleets, as applicable. Acceptable fuel types include bio-diesel, low-sulfur diesel, hydrogen, compressed natural gas, hybrid or all-electric.	New
TO 1.3 Alternative Transportation: Car Pool Programs	.	Provide and maintain a building occupant car pooling program that serves a minimum of 5% of the full time equivalent (FTE) peak period staff and add no new parking. Provide preferred parking for car pool participants.	New

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Energy Efficiency

Title	Intent	Credit Goals	Source
EE Prereq 1 Existing Building Commissioning	Verify that fundamental building systems and assemblies are performing as intended to meet current needs and sustainability requirements.	Verify and ensure that fundamental building elements and systems are installed, calibrated, and operating as intended so they can deliver functional and efficient performance. Carry out a comprehensive existing building commissioning including the following procedures: Develop a comprehensive building operation plan that meets the requirements of current building usage, and addresses the: heating system, cooling system, humidity control system, lighting system, safety systems and the building automation controls. Prepare a commissioning plan for carrying out the testing of all building systems to verify that they are working according to the specifications of the building operation plan. Implement the commissioning plan documenting all the results. Repair or upgrade all systems components that are found to not be working according to the specifications of the building operation plan. Re-test all building components that required repairs or upgrades to verify that they are working according to the specifications of the building operation plan.	LEED-EB
EE Prereq 2 Minimum Energy Performance	Establish the minimum level of energy performance for the building and systems.	Demonstrate that the building has achieved an EPA ENERGY STAR® score of at least 60 utilizing the EPA ENERGY STAR Benchmarking Tool for building types addressed by ENERGY STAR.	LEED-EB
EE Prereq 3 Ozone Protection	Reduce ozone depletion.	Zero use of CFC-based refrigerants in HVAC&R base building systems unless a third party audit shows that system replacement or conversion is not economically feasible.	LEED-EB
EE 1 Optimize Energy Performance	To achieve increasing levels of energy performance to reduce environmental impacts associated with excessive energy use.	Demonstrate ongoing continuous improvement in energy performance above the Energy Star score of 60, as required in Prerequisite 1, for the institution, campus or building as follows:	LEED-EB
		Credit 1.1 Energy Star score of 63	
		Credit 1.2 Energy Star score of 67	
		Credit 1.3 Energy Star score of 71	
		Credit 1.4 Energy Star score of 75	
		Credit 1.5 Energy Star score of 79	
		Credit 1.6 Energy Star score of 83	
		Credit 1.7 Energy Star score of 87	
		Credit 1.8 Energy Star score of 91	
		Credit 1.9 Energy Star score of 95	
		Credit 1.10 Energy Star score of 99	
EE 2 On-Site and Off-Site Renewable Energy	Encourage and recognize increasing levels of on-site and off-site renewable energy in order to reduce environmental and health burdens associated with fossil fuel energy use.	Over the performance period, fulfill some or all of the building's total energy use through the use of on-site or off-site renewable energy systems. Points are earned according to the following table. The percentages shown are the percentage of building energy use over the performance period met by renewable energy resources.	LEED-EB
		1% on site generation or 5% off site Renewable Energy Certificates	
		2% on site generation or 10% off site Renewable Energy Certificates	
		5% on site generation or 25% off site Renewable Energy Certificates	
		10% on site generation or 50% off site Renewable Energy Certificates	
EE 3 Energy Efficient Equipment	Reduce energy consumption by using efficient medical and other equipment.	Obtain and install a minimum 75%, based on cost, of the annual electrical medical and office equipment, that is either Energy Star® qualified, or in the top 25th percentile for energy consumption for that class of equipment.	New

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Title	*Intent*	*Credit Goals*	*Source*
EE 4 Refrigerant Selection	Reduce ozone depletion and support early compliance with the Montreal Protocol.	Do not operate base building HVAC, refrigeration or fire suppression systems that contain HCFCs or Halons. OR Reduce emissions of refrigerants from base cooling equipment to less than 3% of charge per year over the performance period using EPA Clean Air Act, Title VI, Rule 608 procedures governing refrigerant management and reporting and reduce the leakage over the remainder of unit life to below 25%.	LEED-EB
EE 5.1 Performance Measurement: Enhanced Metering	Demonstrate ongoing accountability and optimization of building energy and water consumption performance over time and add incentives for additional energy reduction.	Have in place over the performance period continuous metering for the following items: (Up to 2 points can be earned - one point is earned for each 4 actions implemented/maintained). For each item metered, prepare, implement and maintain a program for using the data gathered to improve building performance over time. - Lighting systems and controls. - Separate building electric meters that allow aggregation of all process electric loads. - Separate building natural gas meters that allow aggregation of all process natural gas loads. - Chilled water system efficiency at variable loads (kW/ton) or cooling loads (for non-chilled water systems). - Cooling load. - Air and water economizer and heat recovery cycle operation. - Boiler efficiencies. - Building specific process energy systems and equipment efficiency. - Constant and variable motor loads. - Variable frequency drive (VFD) operation. - Air distribution, static pressure and ventilation air volumes.	LEED-EB MOD
EE 5.2 Performance Measurement: Emission Reduction Reporting	Reduce building energy use and associated emissions.	Identify building performance parameters that reduce energy use and reduce emissions. - Track and record the significant emission reductions including those delivered by energy efficiency, renewable energy and other building emission reduction actions including: carbon dioxide (CO_2), sulfur dioxide (SO_2), nitrogen oxides (NO_x), mercury (Hg), small particulates (PM2.5), large particulates (PM10), and volatile organic compounds (VOCs). - Report the reductions in emissions resulting from these energy efficiency and renewable operations using a third party voluntary certification program. - Retire at least 10% of the emission reductions, delivered by the energy efficiency actions, through a third party voluntary certification program. - Ask the suppliers of goods and services for the building to do the same by implementing actions above.	LEED-EB

Water Conservation

Title	*Intent*	*Credit Goals*	*Source*
WC Prereq 1 Minimum Water Efficiency	Maximize fixture water efficiency within buildings to reduce the burden on potable water supply and wastewater systems.	Maximize fixture potable water efficiency to achieve a level equal to or below water use baseline, calculated as 120 percent of the water usage that would result if 100% of the total building fixture count were outfitted with plumbing fixtures that meet the Energy Policy Act of 1992 fixture performance requirements. If the building does not have separate metering for each water use (fixture use, process use, irrigation and other uses) the water use reduction achievements can be demonstrated with calculations. At least one meter for the overall building water use is required and metering for cooling towers and other process water uses are encouraged but not required.	LEED-EB
WC 1 Water Use Reduction: Water Efficient Landscaping	Limit or eliminate the use of potable water for landscaping irrigation.	Use high-efficiency irrigation technology OR use captured rain or recycled site water to reduce potable water consumption for irrigation in comparison to conventional means of irrigation. Achieve reductions in potable water use for irrigation over conventional means of irrigation.	LEED
		Credit 1.1 Reduce potable water use by 50%.	
		Credit 1.2 Reduce potable water use by 100%.	
WC 2 Building Water Use Reduction	Maximize fixture water efficiency within buildings to reduce the burden on potable water supply and wastewater systems.	Have in place over the performance period strategies and systems that in aggregate produce a reduction of fixture potable water use from the calculated fixture water usage baseline established in WC Prerequisite 1. If the building does not have separate metering for each water use (fixture use, process use, irrigation and other uses) the water use reduction achievements can be demonstrated with calculations. At least one meter for the overall building water use is required and metering for cooling towers and other process water use is encouraged but not required.	LEED-EB
		Credit 2.1 Reduce potable water use by 10%.	
		Credit 2.2 Reduce potable water use by 20%.	
WC 3 Process Water Efficiency	Reduce process potable water use and process wastewater generation.	Process water is defined as water used for non-sanitary purposes. Examples of process water use in a health care facility include imaging equipment, microscopes, decontamination equipment, other diagnostic and lab equipment, dietary equipment and laundry facilities.	New
		Credit 3.1 Adopt technologies and strategies to reduce process water use and process wastewater generation by 20%. Document the reductions from baseline.	
		Credit 3.2 Adopt technologies and strategies to reduce process water use and process wastewater generation by 30%.	
		Credit 3.3 Adopt technologies and strategies to reduce process water use and process wastewater generation by 40%.	
WC 4 Water Use Reduction: Measurement	Provide for the ongoing optimization and conservation of building potable water consumption over time and in areas of the facility not otherwise impacted by construction.	Provide for long term continuous measurement of potable water uses within the facility. Provide individual meters for the following water uses (as applicable to the project): -Water use in laboratory -Water use in dietary department -Water use in central sterile and processing department -Water use in laundry -Water use in radiology and imaging department -Water use in Surgical Suite -Purified water system (reverse osmosis and/or de-ionized) and filter backwash water -Outdoor irrigation systems -Cooling tower make-up and filter backwash water -Steam boiler system make-up water -Closed loop hydronic system make-up water - Water use in mechanical equipment, including pumps	LEED-EB MOD

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Chemical Management

Title	*Intent*	*Credit Goals*	*Source*
CM Prereq 1 Polychlorinated BiPhenyl (PCB) Removal	Reduce the potential exposure of building occupants to PCBs and PCB combustion by-products in case of fire in the building.	Establish a PCB management program. Identify the applicable regulatory requirements. Have a current survey that identifies where PCBs are located in the building and on the site so that the PCBs present can be addressed appropriately in the ongoing PCB management program.	LEED-EB
CM 1.1 Community Contaminant Prevention: Airborne Releases	Minimize building airborne effluents and environmental, health and safety burdens to site and neighbors.	Exceed by 10% the NIH-CDC Guidelines for Airborne Effluent from Laboratories that Handle Biohazards (CDC-NIH Biosafety in Microbiological and Biomedical Laboratories, latest edition (currently May 1999)). Meet all standards of California South Coast Air Quality Management District for all products of combustion. Obtain low sulfur diesel or bio-diesel fuels for generators and other diesel equipment.	New (EPC)
CM 1.2 Community Contaminant Prevention: Leaks & Spills	Prevent releases of hazardous chemicals and fuels to storm sewer.	Develop and implement a policy to use containment and engineering controls to manage outdoor storage of fuels and chemicals in order to minimize risk from leakage and spills.	New (EPC)
CM 2 Indoor Pollutant Source Control: High Hazard Chemical Management	Avoid exposure of building occupants to potentially hazardous indoor pollutants and chemicals that adversely impact air quality and human health.	Develop a policy for receiving, handling, storing and disposing of high hazard substances. Include the purchasing department in developing standards for evaluating hazardous chemicals prior to purchase. Minimize the use of hazardous chemicals in specific applications (refer to Credit language for list)	New
CM 3.1 Chemical Discharge: Chemical Waste Minimization Plan	Protect natural habitat, waterways and water supply from pollutants carried by building discharge water.	Protect municipal sewage treatment works from pollutant discharge from building operations. Prepare a chemical waste minimization plan to minimize or eliminate chemical waste drainage to the sanitary system that includes: - A listing of chemical products and systems for the evaluation and implementation of less toxic alternatives. Priority areas include: Dialysis, Environmental Services, Facilities Management/Engineering, Laboratory/Pathology/Histology, Nutrition Services, Pharmacy, -Radiology, Sterile Processing, and Surgical Services. - A description of chemical storage areas and description and implementation of secondary containment.	New
CM 3.2 Chemical Discharge: Pharmaceutical Waste Minimization Plan	Reduce pharmaceutical wastes in sanitary sewer discharge.	Develop an integrated pharmaceutical waste management system in which all waste bulk chemotherapy items are segregated and managed as hazardous waste, all other waste pharmaceuticals are segregated into hazardous or non-hazardous waste, and no antibiotics, hormones or other pharmaceutical waste is drain disposed to the sanitary sewer system. Develop a pharmaceutical waste minimization plan that includes: - Non-hazardous pharmaceutical waste: Segregate into dedicated containers for disposal at a regulated landfill permitted to accept non-hazardous pharmaceutical waste; - Non-chemotherapy pharmaceutical waste that meets the definition of a hazardous waste: Identify, segregate, label, store, and manage as hazardous waste as defined in the Resource Conservation and Recovery Act (RCRA); - Bulk chemotherapy waste: Segregate from trace chemotherapy waste, label, store, and manage bulk chemotherapy waste as hazardous waste as defined in the RCRA.	New

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Waste Management

Title	***Intent***	***Credit Goals***	***Source***
WM Prereq 1 Waste Stream Audit	Establish minimum source reduction and recycling program elements and quantify current waste stream production volume.	Conduct a waste stream audit of the ongoing waste stream to establish a current baseline identifying the types and amounts of waste stream constituents. At a minimum, the audit should determine the amounts for paper, glass, plastics, cardboard, regulated medical waste, hazardous waste and metals in the waste stream. Operate over the performance period a procurement/management policy to reduce waste stream through purchasing strategies, collection station equipment and occupant education.	LEED-EB
WM 1 Total Waste Reduction	Reduce solid waste disposal in landfills and incinerators generated by healthcare facilities through reduction, reuse, recycling and composting.	Have in place over the performance period a Waste Management Plan and implementation strategies to prioritize reduction, reuse, recycling, and composting to divert wastes from disposal in landfills and incinerators. Incorporate steps into the facility's Waste Management Plan to eliminate, minimize, substitute and safely dispose of wastes generated by the facility using reduction of disposables and single use devices. Incorporate steps into the facility's Waste Management Plan that address the separation, collection and storage of materials for recycling, including (at a minimum) paper, glass, plastics, cardboard/OCC, metals, batteries and fluorescent lamps. The Plan should be designed to collect and recycle a minimum of 95% of batteries and a minimum of 95% of fluorescent lamps discarded. Each time reusable architectural elements, such as panels, are moved and reinstalled, they can be counted as part of the total waste stream and included in the recycled component of the waste stream. Incorporate steps into the facility's Waste Management Plan to implement best available technology (BAT) alternatives to incineration AND For existing health care facilities, reduce total waste below 1998 levels as indicated in the table which follows (by weight or volume):	LEED-EB MOD
		Credit 1.1 Reduce total waste volume by a minimum of 30%.	
		Credit 1.2 Reduce total waste volume by a minimum of 40%.	
		Credit 1.3 Reduce total waste volume by a minimum of 50%.	
WM 2 Regulated Medical Waste Reduction	Reduce solid waste disposal in landfills and incinerators generated by health care facilities through reduction, reuse, recycling and composting.	Credit 2.1 Demonstrate that total regulated medical waste volume or weight is less than 10% of the solid waste stream from the facility.	New
		Credit 2.2 Demonstrate that incineration will be used to dispose of only that fraction of the waste stream required by regulations to be incinerated. (Pyrolysis is not considered an acceptable alternative to incineration.)	
WM 3 Food Waste Reduction	Reduce solid waste disposal in landfills and incinerators generated by health care facilities through reduction, reuse, recycling and composting.	Develop a food waste diversion and collection plan, consistent with health and solid waste regulations, for all food use areas including but not limited to: catering, patient rooms, cafeteria and food preparation areas. Divert a minimum of 75% of food service organic waste by weight from the solid waste stream. Diversion may include any combination of animal feed, compost or donation. Provide controlled areas to facilitate easy removal of food waste, consistent with facility Integrated Pest Management (IPM) plan.	New

Environmental Services

Title	*Intent*	*Credit Goals*	*Source*
ES 1 Outdoor Grounds and Building Exterior Management	Encourage grounds/site/building exterior management practices that preserve ecological integrity, enhance biodiversity and protect wildlife while protecting the health of building occupants.	Have in place over the performance period a low-impact site and green building exterior management plan that addresses the topics listed below. One point is earned for each four items addressed: - Maintenance equipment - Plantings - Animal and vegetation pest control - Landscape waste - Fertilizer use - Snow removal (where applicable) - Cleaning of building exterior - Paints and sealants used on building exterior - Other maintenance of the building exterior	LEED-EB
ES 2 Indoor Integrated Pest Management	Reduce human exposure to physical and chemical hazards and odors associated with pest management products and practices by employing custodial operations that use safe methods and low-toxicity or non-toxic pest management products.	Develop and implement an Integrated Pest Management Program for managing pest control in the building interior, including, at a minimum: - Methods of identifying pests and monitoring levels of infestation. - Stated action thresholds, or the level of infestation that can be tolerated. - Listing of preventive or corrective actions to be employed (such as sanitation, structural repairs, and ongoing maintenance), traps, and the judicious use of pesticides.	LEED-EB MOD
ES 3 Environmentally Preferable Cleaning Policy	Limit exposure of building occupants and maintenance personnel to potentially hazardous chemical, biological and particulate contaminants.	Develop and maintain an environmentally preferable cleaning policy for all surfaces, including floors, walls, furniture and medical equipment addressing: -Sustainable floor care systems. - Levels of required disinfection for all surfaces. - Sustainable cleaning systems. - Use of sustainable cleaning products. - Use of chemical concentrates and appropriate dilution systems. - Proper training of maintenance personnel in the hazards, use, maintenance and disposal of cleaning chemicals, dispensing equipment and packaging. - Use of hand soaps that do not contain antimicrobial agents (other than as a preservative system), except where required by health codes and other regulations (i.e., food service and health care requirements). - Use of cleaning equipment that does not negatively impact IAQ.	LEED-EB MOD
ES 4.1 Sustainable Cleaning Products & Materials	Limit exposure of building occupants and maintenance personnel to potentially hazardous chemical, biological and particulate contaminants.	Adopt and implement sustainable purchasing policy for cleaning products and materials. Cleaning product and material purchases include building purchases for use by in-house staff or used by outsourced service providers. Calculate the percentage of the total sustainable material and product purchases that meet the specified sustainability criteria. One point will be awarded for each 30% of the total annual purchases of these products (on a cost basis) that meet the following sustainability criteria (up to 3 points): - Cleaning products that meet the Green Seal GS-37 standard if applicable, OR if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels. - Minimize added fragrances in cleaning products.	LEED-EB MOD
ES 4.2 Environmentally Preferable Janitorial Equipment		Develop, implement and maintain a policy for the use of janitorial equipment that maximizes effective reduction of building contaminants while minimizing environmental and health burdens.	LEED-EB

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Environmentally Preferable Purchasing

Title	*Intent*	*Credit Goals*	*Source*
EP 1.1 Food: Organic or Sustainable	Support sustainable food production and improved environmental health through purchase of organic, drug free and locally produced food products.	Organic or Sustainable Food Procure at least 25% of combined food and beverage purchases from sources that are: - USDA certified organic - Food Alliance Certified - Rainforest Alliance Certified - Protected Harvest - Fair Trade Certified AND/OR - local farms within a 100 mile radius of the facility.	NEW
EP 1.1 Food: Antibiotics		Antibiotics in Meat Production Adopt a meat procurement purchasing policy that includes the following requirements. - Regularly and consistently inform suppliers of meat, poultry, dairy, and seafood products of the preference for purchasing products that have been produced without non-therapeutic use of antibiotics, particularly those that belong to classes of compounds approved for use in human medicine. Procure a minimum of 50% of the total volume of such purchasing in compliance with this requirement.	
EP 1.2 Local Production / Food Security		Farmers Markets Host and promote on-site farmers market during growing season(s), OR Support and promote local farmers market during growing season(s), OR Farmers-Consumer Links Provide access and support of direct farmer-to-consumer link, such as Community Supported Agriculture and/or food box program to patients, with a priority on low income population, OR Farms and Gardens Support on-site food producing garden and/or urban food producing garden programs that are accessible to the public.	
EP 2 Janitorial Paper & other Disposable Products	Reduce use of virgin paper resources in janitorial and other disposable product applications.	Develop and maintain a low environmental impact disposable product policy, addressing the following: - Use disposable janitorial paper products and trash bags that meet the most current Comprehensive Procurement Guidelines (CPG) for recycled content, AND - Give preference to paper products that are manufactured Process Chlorine-Free, AND - Use large rolls wherever possible, and hands-free dispensers that limit paper portions, AND - Do not use C-fold or multi-fold paper towel systems.	New

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Title	*Intent*	*Credit Goals*	*Source*
EP 3 Electronics Purchasing and Take Back	Require take back and management services for end-of-life electronic products to safely manage hazardous compounds.	Develop IT Assets Management Team that has staff from IT, Environmental Services/ Recycling, Procurement, Administration and Risk Officers. Develop an IT-Environmental Management Plan. The IT-Environmental Management Plan should include strategies around Procurement, Reduction, responsible reuse, and responsible recycling. Each of these strategies should be in compliance with federal and state regulations and include: - Manufacturers' written commitments of equipment take-back at end of product life. - Only those recyclers that have signed the Recycler's Pledge of Environmental Stewardship, and verified that they do not export hazardous waste shall be contracted with. - The plan should comply with all state and federal hazardous waste regulations, including Universal Waste Rules. - A HIPAA compliance plan for electronic products.	NEW
EP 4.1 Toxic Reduction: Mercury	Eliminate stand-alone mercury-containing medical devices and reduce mercury discharge through product substitution and capture.	Develop a mercury free policy. Eliminate specification and use of barometers, medical devices, and other stand-alone mercury containing medical equipment. Purchase mercury free MRI equipment, wheel chairs, automated beds and other medical and laboratory equipment. Purchase low mercury fluorescent tubes and compact fluorescent lamps, and low mercury high intensity discharge bulbs such that average mercury content in fluorescent tubes and compact fluorescent lamps does not exceed 5 mg of mercury, and that high-intensity discharge lamps have the lowest available mercury content, providing that all other performance specifications are met. Collection and disposal of any mercury devices shall be designated for recycling and preclude overseas donation/disposal. Develop a mercury spill protocol, and hold recaptured mercury for safe disposal.	LEED-EB MOD
EP 4.2 Toxic Reduction: DEHP	To reduce and limit the exposure of patients, staff and visitors to DEHP from clinical products plasticized with DEHP.	DEHP is used extensively as a plasticizer in PVC containing products. Facilities shall develop a DEHP elimination plan. The plan shall require: - Audit and identify use areas of flexible PVC (or vinyl) plasticized with DEHP. Tubing, IV and blood bags are the primary end uses for disposable PVC medical products. - Develop a DEHP-free implementation plan, including timelines for phaseout for procedures identified by the FDA as high risk. - According to the FDA these highest risk procedures are total parenteral nutrition in neonates (with lipids in PVC bag), enteral nutrition in neonates and adults, multiple procedures in sick neonates (high cumulative exposure), hemodialysis in peripubertal males or pregnant or lactating women, exchange transfusion in neonates, heart transplantation or coronary artery bypass graft surgery (aggregate dose), massive infusion of blood into trauma patient, extracorporeal membrane oxygenation (ECMO) in neonates, transfusion in adults undergoing ECMO. - Directs the facility purchasing department and/or Group Purchasing Organization to require manufacturers to label DEHP containing products. - Include a purchasing policy which gives preference to DEHP-free clinical and other products.	NEW
EP 4.3 Toxic Reduction: Natural Rubber Latex	Eliminate air contaminants and allergens emitted from medical supplies and devices and that release volatile organic compounds and other chemicals to ensure the health of building occupants and staff.	Establish and implement a policy prohibiting the procurement and use of natural rubber latex surgical gloves, balloons, and other products and materials containing natural rubber latex in health care facilities. Establish and implement a policy prohibiting the procurement and use of natural rubber latex in carpet backing.	NEW

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Title	*Intent*	*Credit Goals*	*Source*
EP 5 Furniture and Medical Furnishings	Reduce the environmental impacts from the manufacture, use and disposal of furniture and medical furnishings products.	Purchase 40% of annual volume of furniture and medical furnishings that complies with the requirements of Construction: MR Credit 9.1-9.3 Furniture and Medical Furnishings.	LEED-EB MOD
EP 6 IAQ Compliant Products	Enhance building indoor air quality (IAQ) through procurement and implementation of low-emitting products and processes.	Optimize use of air quality compliant materials inside the building to improve the building's emission profile. Points are awarded for the existence of sustainable product purchasing policies for the building and site addressing these requirements, and documentation of purchasing during the performance period in conformance with those policies, as described below. Subsequent re-certification is tied to both policies and purchasing performance, as described below. At a minimum, these policies must include the following product groups: paints and coatings, adhesives, sealants, carpet, composite panels, agrifiber products and building materials used inside the building. The building materials covered include any building materials used for improvements, including upgrades, retrofits, renovations or modifications, inside the building. One point shall be awarded, up to a maximum of 2 points, for each 45% of annual purchases calculated on a dollar value that conform with one of the following sustainability criteria: - Adhesives and sealants with a VOC content that complies with Construction: EQ Credit 4.1 Credit Goals, OR - Paints and coatings with VOC emissions that do not exceed the VOC and chemical component limits of Green Seal's Standard GS-11 requirements and complies with Construction: EQ Credit 4.2 Credit Goals, OR - Carpet that meets the Credit Goals of Construction: EQ Credit 4.3, OR -Composite panels, agrifiber products and insulation that contain no added urea-formaldehyde resins and comply with Credit Goals of Construction: EQ Credit 4.4.	LEED-EB

Innovation in Operations

Title	*Intent*	*Credit Goals*	*Source*
IN 1 Innovation in Operation	To provide project teams and projects the opportunity to achieve points for exceptional performance above requirements set by the *Green Guide for Health Care: Operations* and/or innovative performance for Green operations strategies not specifically addressed by the *Green Guide for Health Care*.	Identify the intent of the proposed innovation credit, the proposed requirement for compliance, the proposed documentation to demonstrate compliance, and the operational approach used to meet the required elements.	LEED-EB
IN 2 Documenting Sustainable Operations: Business Case Impacts	Document sustainable building cost impacts.	Document overall building operating costs for the previous five years (or length of building occupancy, if shorter), and track changes in overall building operating costs over the performance period. Document building operating cost and financial impacts of all of the aspects of *Green Guide* implementation on an ongoing basis.	LEED-EB
IN 3.1 Documenting Productivity Impacts: Absenteeism and Health Care Cost Impacts	Document absenteeism, health care cost and productivity impacts of sustainable building performance improvements.	Document the history of absenteeism and health care costs for building occupants for the previous five years (or length of building occupancy with a minimum of 12 months) and track changes in absenteeism and health care costs (claim costs must be provided and any reductions in premium costs should be provided if available) for building occupants over the performance period relative to sustainable building performance improvements.	LEED-EB
IN 3.2 Documenting Productivity Impacts: Other Productivity Impacts	Document other productivity impacts of sustainable building performance improvements.	Document other productivity impacts (beyond health impacts outlined in IN Credit 3.1) of sustainable building performance improvements for building occupants. Address and track changes in staff recruitment, satisfaction or retention, clinical performance measures (medical errors, for example) for building occupants over the performance period relative to sustainable building performance improvements, for a minimum of 12 months.	LEED-EB MOD

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Construction Credits

Integrated Design

Required **ID Prerequisite 1**

Integrated Design Process

Intent

Achieve an effective collaborative design process and outcome by engaging the multiple design disciplines, as well as owners, users, constructors, facility managers and operations personnel.

Health Issues

Integrated teams are necessary for successful application of green building solutions. The conventional construction of health care facilities, with its myriad technical requirements, is often fragmented and disjointed with members of the design team competing for limited construction funds. Participation of all members of the design team throughout the process will enable cross-discipline decision making relative to such issues as building siting, configuration, envelope and HVAC design.

Integration leads to perceiving the building as a set of interrelated and interdependent systems where a single design decision can trigger multiple systemic improvements. The purpose of this prerequisite is to encourage design teams to organize for success in implementing green building solutions. The merging of ideas, perspectives and areas of expertise facilitated by an open communications process reaps multiple benefits, as the project team moves from the optimization of single systems in isolation to the optimization of the entire building enterprise. Establishing vertical support throughout the organization helps ensure success.

Credit Goals

- Use cross discipline design and decision making starting early in the process & continuing throughout to take advantage of interrelationships between systems. Include representation early on in the design process from all end user stakeholders, including owners, physician teams, nursing, administrators, support services, housekeeping staff, and engineering/ maintenance personnel.

Documentation

q Compile copies of the Goals Statements, performance checklists, and/or other design tools used in the development of the project's high performance design components.

q Identify obstacles that were encountered that prevented the team from realizing the originally identified goals and/or performance targets.

Reference Standards

There is no reference standard for this credit.

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ID Prerequisite 1 continued

Integrated Design

Potential Technologies & Strategies

Reinforce corporate/institutional commitments to environmental health and community responsibility. Use cross discipline design, decision-making, and charrettes. Use goal setting workshops and build a team approach. Prepare checklists for points and strategies prior to beginning the design process; refer to these at milestones during the design process.

Engage owner, staff, contractors, user groups and community groups, educating them on the benefits of green design and bringing them in to the design process at key points in the decision-making process.

Register your project and design team to participate in the GGHC Pilot at www.gghc.org to participate in peer-to-peer problem solving in the GGHC Forum with other teams also working to achieve sustainable design goals and objectives.

Required

ID Prerequisite 2

Environmental Health Mission Statement & Program

Intent

Establish environmental health goals and use as a basis for selection and implementation of building design, construction, and operational strategies.

Health Issues

Prevention is a fundamental principle of health care and public health. The health care industry acknowledges that prevention is preferable to treatment of disease after it has occurred. In the face of uncertainty, precautionary action is appropriate to prevent harm. This public health approach makes sense both in the clinical setting and in response to environmental and public health hazards. Similarly, a precautionary and preventive approach is an appropriate basis for decisions regarding health care building design and materials choices and activities.

Credit Goals

- Prepare an environmental health mission statement and program to complement the facility's functional design program. The environmental health program shall be retained by the facility with the other design data to assure that future alterations, additions, and program changes are consistent with the intent of the environmental health program.

Documentation

q Prepare a copy of the environmental health mission statement and program.

Reference Standards

There is no reference standard for this credit.

Potential Technologies and Strategies

Develop this document as an initial component of an integrated design charrette, to serve as a basis for decisions regarding sustainable design and operations. This environmental health program shall describe project design goals that minimize the potential adverse impacts of the project on the health of occupants, the local community, and the global environment while enhancing the healing environment for patients and the work environment for the staff. This shall be a guiding document for design team selection, design criteria development, and construction documents.

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Sustainable Sites

Required **SS Prerequisite 1**

Erosion & Sedimentation Control

Intent

Control erosion to reduce negative impacts on water and air quality.

Health Issues

Controlling erosion and sedimentation retains soil resources on site, preventing contaminated run-off from entering aquatic bodies with potential for human exposure to waterborne pollutants and toxic chemicals, and dispersion of dust and particulate matter that can exacerbate respiratory illnesses.

Credit Goals

- Develop a site sediment and erosion control plan, specific to the site, that conforms to United States Environmental Protection Agency (EPA) Document No. EPA-832R-92-005 (September 1992), Stormwater Management for Construction Activities, Chapter 3, OR local erosion and sedimentation control standards and codes, whichever is more stringent. Assure that the plan meets the following objectives:
  - Prevent loss of soil during construction by stormwater run-off and/or wind erosion, including protecting topsoil by stockpiling for reuse.
  - Prevent sedimentation of storm sewer or receiving streams.
  - Prevent polluting the air with dust and particulate matter.

Documentation

q Prepare a Site Protection Plan and specifications, by civil engineer or responsible party, noting how the project follows local erosion and sedimentation control standards or the referenced EPA standard (whichever is more stringent) and identifying the limits of construction and disturbance and protection measures, including erosion control measures highlighted.

Reference Standards

United States Environmental Protection Agency (EPA) Document No. EPA-832R-92-005 (September 1992), Stormwater Management for Construction Activities, Chapter 3, www.epa.gov.

Potential Technologies & Strategies

Adopt an erosion and sedimentation control plan for the project site during construction. Consider employing strategies such as temporary and permanent seeding, mulching, earth dikes, silt fencing, sediment traps, and sediment basins. Other methods include protection of existing vegetation including protection of clusters or groupings of existing vegetation (i.e. tree or shrub masses) rather than isolated plant material in order to minimize unnecessary ground disturbance (topsoil stripping) and removal of existing groundcover.

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1 point

SS Credit 1
Site Selection

Intent

Avoid development of inappropriate sites and reduce the environmental impact from the location of a building on a site.

Health Issues

Sustainable site selection criteria contribute to healthy ecosystems – clean air and clean water – thereby enhancing the public health by protecting wetlands, agricultural lands and open spaces. Biodiversity protects ecosystems, water systems and endangered and threatened species.

Credit Goals

- Do not develop buildings, roads or parking areas on portions of sites that meet any one of the following criteria:
  - Prime farmland as defined by the United States Department of Agriculture in the United States Code of Federal Regulations, Title 7, Volume 6, Parts 400 to 699, Section 657.5 (citation 7CFR657.5).
  - Land whose elevation is lower than 5 feet above the elevation of the 100-year flood as defined by the Federal Emergency Management Agency (FEMA).
  - Land which is specifically identified as habitat for any species on the Federal or State threatened or endangered lists.
  - Within 100 feet of any water including wetlands as defined by United States Code of Federal Regulations 40 CFR, Parts 230-233 and Part 22, and isolated wetlands or areas of special concern identified by state or local rule, OR greater than distances given in state or local regulations as defined by local or state rule or law, whichever is more stringent.
  - Land which prior to acquisition for the project was public parkland, unless land of equal or greater value as parkland is accepted in trade by the public landowner (Park Authority projects exempt).

Documentation

q Obtain verification from the civil engineer that the project site meets the credit goals.

Reference Standards

American Farmland Trust Definition of Prime Agricultural Land, www.farmland.org.

Federal Emergency Management Agency (FEMA) 100-Year Flood Definition, www.fema.gov.

Regional Endangered Species Lists, http://endangered.fws.gov.

40 CFR, Parts 230-233, and Part 22. Code of Federal Register, http://www.gpoaccess.gov/cfr/index.html

Potential Technologies & Strategies

Give preference to sites that do not include sensitive site elements and restricted land types. Select a suitable building location and design the building with the minimal footprint to minimize site disruption. Strategies include stacking the building program, tuck under parking, and sharing facilities with neighbors.

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1 point

SS Credit 2

Development Density

Intent

Channel development to urban areas with existing infrastructures, protect greenfields and preserve habitat and natural resources. In rural areas, increase development density on existing or previously developed sites rather than undeveloped rural land.

Health Issues

Siting decisions for hospitals and related health care facilities reflect regional health care needs, often requiring a rural site selection to keep pace with development patterns. Locating new facilities where development exists minimizes sprawl and the resulting unhealthful air quality and sedentary lifestyle indicators associated with auto-dependence and transportation-related air pollution. Several studies show that increased sprawl correlates with obesity and high blood pressure.

Credit Goals

- Increase localized density to conform to governmental density goals by utilizing sites that are located within an existing minimum development density of 80,000 square feet per acre (two story downtown development)

OR

- For previously developed rural sites, increase density of the existing site to a minimum development density of 30,000 square feet per acre.

Documentation

q Prepare the calculation demonstrating that the project has achieved the required development densities. Obtain density calculations for the project site and for the surrounding area.

q Prepare an area plan with the project location highlighted.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

During the site selection process, give preference to urban sites with high development densities. Quantify the development density of the project as well as the surrounding area. For health care providers in rural areas, increase development density on previously developed sites rather than achieving expansion through acquisition of undeveloped rural land.

Resources

Urban Land Institute, washington.uli.org, a non-profit organization that promotes the responsible use of land to enhance the environment.

Smart Growth America, www.smartgrowthamerica.com/health.html.

Natural Resources Defense Council, www.nrdc.org.

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1 point

SS Credit 3.1

Brownfield Redevelopment**: Basic Remediation Level**

Intent

Rehabilitate damaged sites where development is complicated by real or perceived environmental contamination, reducing pressure on undeveloped land.

Health Issues

With appropriate remediation, brownfield redevelopment has the potential to protect public health by safely removing health hazards from communities while preserving the public health benefits of undeveloped land.

Credit Goals

- Develop on a site documented as contaminated (by means of an ASTM E1903-97 Phase II Environmental Site Assessment) OR on a site classified as a brownfield by a local, state or federal government agency. Effectively remediate site contamination.

Documentation

- Document the pertinent sections of the ASTM E1903-97 Phase II Environmental Site Assessment describing the site contamination OR obtain documentation from a local, state or federal regulatory agency confirming that the site is classified as a brownfield by that agency.
- Obtain documentation, including test results, declaring the type of damage that existed on the site and describing the remediation performed.

Reference Standards

ASTM E1903-97 Phase II Environmental Site Assessment

Potential Technologies & Strategies

During the site selection process, consider opportunities and risks associated with potential brownfield sites. Identify tax incentives and property cost savings by selecting a brownfield site. Develop and implement a site remediation plan and clean up the site using remediation strategies such as pump-and-treat, bioreactors, land farming, and in-situ remediation. Consider plant selection strategies that incorporate varieties with a natural capacity to absorb and filter out pollutants.

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1 point

SS Credit 3.2

Brownfield Redevelopment: **Residential Remediation Level**

Intent

Rehabilitate damaged sites where development is complicated by real or perceived environmental contamination, reducing pressure on undeveloped land.

Health Issues

Redeveloping brownfields can be an effective strategy to improve environmental quality; however, stringent remediation technologies and standards are required in brownfield rehabilitation to protect the health and safety of the vulnerable people residing and working in a health care facility.

Existing brownfield regulations are inconsistent and differ greatly in their requirements. To achieve this additional Brownfield Redevelopment credit, the health care facility must insure protection of public health through rigorous remediation and consistent compliance with chemical thresholds for the most vulnerable.

Note that remediation of a single site may leave adjacent properties with problematic levels of contamination, thus potentially subjecting patients or the surrounding community to unhealthful exposure.

Credit Goals

- Develop on a site documented as contaminated (by means of an ASTM E1903-97 Phase II Environmental Site Assessment) OR on a site classified as a brownfield by a local, state or federal government agency.
- Remediate the site to the Residential level as defined by the EPA Region 9 Preliminary Remediation Guidelines.
- Obtain state agency clearance for construction of a hospital on the remediated site.
- Verify that the site is not within 2000 feet of another site documented as contaminated (by means of an ASTM E1903-97 Phase II Environmental Site Assessment) OR a site classified as a brownfield by a local, state, or federal government agency, unless remediated to the Residential level as defined by the EPA Region 9 Preliminary Remediation Guidelines.

Documentation

q Document the pertinent sections of the ASTM E1903-97 Phase II Environmental Site Assessment describing the site contamination OR obtain documentation from a local, state or federal regulatory agency confirming that the site is classified as a brownfield.

q Obtain documentation, including test results, demonstrating compliance with the EPA Region 9 regulations.

q Obtain a copy of state agency clearance certification.

q Obtain verification from the civil engineer or authorized party that the adjacent properties have been surveyed and determined not to be sources of potential hazards.

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SS Credit 3 continued
Brownfield Redevelopment

Reference Standards

EPA Sustainable Redevelopment of Brownfields Program, www.epa.gov/brownfields.

EPA Region 9 Preliminary Remediation Guidelines, http://www.epa.gov/region9/waste/sfund/prg/index.htm.

ASTM E1903-97

Potential Technologies & Strategies

During the site selection process, consider opportunities and risks associated with potential brownfield sites, as well as costs of remediation. Identify tax incentives and property cost savings by selecting a brownfield site. Develop and implement a site remediation plan and clean up the site using remediation strategies such as pump-and-treat, bioreactors, land farming, and in-situ remediation. Consider plant selection strategies that specify species with a natural capacity to absorb and filter out pollutants.

Resources

Rafson, Harold Jl, and Rafson, Robert N., Brownfields, Redeveloping Environmentally Distressed Properties, 1999.

Russ, Thomas A., Redeveloping Brownfields, 2000.

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1 point

SS Credit 4.1

Alternative Transportation: **Public Transportation Access**

Intent

Reduce pollution and land development impacts from automobile use.

Health Issues

Motor vehicles represent the largest single source of atmospheric pollution including nitrogen oxides (a precursor of smog); benzene (a carcinogen); particulate matter (a trigger of respiratory illness and symptoms); volatile organic compounds (some of which are potentially hazardous and precursors of smog); carbon dioxide (a greenhouse gas); and carbon monoxide (a contributor to heart disease).

Credit Goals

- Locate the building entrance within 1/2 mile of a commuter rail, light rail or subway station or 1/4 mile of two or more public or campus bus lines usable by building occupants.

Documentation

- q Prepare an area drawing or transit map highlighting the building location and the fixed rail stations and bus lines, and indicate the distances between them. Include a scale bar for distance measurement.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Perform a transportation survey of future building occupants to identify transportation needs. Site the building near mass transit, or establish shuttle services to encourage use of mass transit options.

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1 point

SS Credit 4.2

Alternative Transportation: **Bicycle Storage and Changing Rooms**

Intent

Reduce pollution and land development impacts from automobile use.

Health Issues

Encouraging bicycling to work prevents emissions associated with motorized transport and enhances the health of the bicyclist. According to the World Health Organization, people who regularly commute by bicycle have a 40% reduction in mortality compared with people who do not bicycle to work.

Credit Goals

- Provide secure bicycle storage and convenient changing/shower facilities (within 200 yards of the building) for 3% or more of peak building day shift staff. Provide one shower per 8 cyclists. (Staff shower facilities within the building may be counted.)

Documentation

q Compile site drawings and documents highlighting bicycle storage and changing and shower facilities. Include calculations demonstrating that these facilities have the capacity to accommodate a minimum of 3% of the day shift staff.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Design the building with transportation amenities such as bicycle storage and showering/changing facilities. Shower and changing facilities may be shared with those provided in Staff Locker facilities within the building.

Ideal bicycle storage for staff is enclosed lockers or other secure systems, conveniently located.

Consider the abilities of patients using the specific facility being designed. Patients treated in medical office buildings may be capable of commuting by bicycle, consistent with an emphasis on preventative medicine.

Conduct annual reviews of commute modes and preferences and increase bicycle storage capacity if needed to meet potential demand.

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1 point

SS Credit 4.3

Alternative Transportation: **Alternative Fuel Vehicles**

Intent

Reduce pollution from local emissions of fossil-fuel combustion powered vehicles.

Health Issues

Health care facilities normally operate fleets of vehicles for the purposes of maintaining and operating their facilities. These vehicles range from ambulances to delivery vans to shuttle buses, which often operate continuously and relatively locally. Motor vehicles represent the largest single source of atmospheric pollution including nitrogen oxides (a precursor of smog); benzene (a carcinogen); particulate matter (a trigger of respiratory illness and symptoms); volatile organic compounds (some of which are potentially hazardous and precursors of smog; carbon dioxide (a greenhouse gas); and carbon monoxide (a contributor to heart disease). By reducing emissions, alternative fuel fleets contribute to healthier air quality, benefiting the health of the building occupants and the surrounding and global communities.

Credit Goals

- Provide preferred parking and fueling stations for a 100% alternative fueled fleet if that fleet comprises a minimum of 50% of total fleet mileage driven annually. Acceptable fuel types include bio-diesel, low-sulphur diesel, hydrogen, compressed natural gas, hybrid or all-electric.

OR

- Install alternative-fuel refueling station(s) for 3% or more of the total vehicle parking capacity of the site.

OR

- Provide preferred parking programs for hybrid or alternative fuel vehicles for at least 10% of the total vehicle parking capacity.

Documentation

- Compile site drawings highlighting alternative fuel refueling stations. Provide calculations demonstrating that these facilities accommodate 100% of the alternative fueled fleet or at least 3% of the total vehicle parking capacity. Provide documentation that the alternative fuel refueling stations proposed will serve current available street legal vehicles.

OR

- Prepare calculations indicating that preferred parking for hybrid and/or alternative fuel vehicles is being provided for at least 10% of the total vehicle parking capacity. Provide site drawings or parking plan highlighting preferred parking for hybrid and/or alternative fuel vehicles.

Reference Standards

There is no reference standard for this credit.

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SS Credit 4.3 continued

Alternative Transportation: **Alternative Fuel Vehicles**

Potential Technologies & Strategies

Alternative fuel vehicle fleets can be used to provide on campus transportation or between campus transportation, transportation to remote parking and staff housing, ambulance and ambulette fleets, and carpool/vanpool programs.

Low sulfur diesel fuel and biodiesel are becoming available in many markets nationwide, particularly in regions designated as non-attainment areas or where there are high levels of ground level ozone. Low sulfur diesel fuels can be used in all diesel engines without modifications. Biodiesel is usable in most diesel engines as well, although in some older engines may require changing of rubber gaskets and more frequent changing of filters during initial use as it cleans the system.

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1 point

SS Credit 4.4

Alternative Transportation: **Parking Capacity**

Intent

Reduce pollution and land development impacts from single occupancy vehicle use.

Health Issues

Motor vehicles represent the largest single source of atmospheric pollution including nitrogen oxides (a precursor of smog); benzene (a carcinogen); particulate matter (a trigger of respiratory illness and symptoms); volatile organic compounds (some of which are potentially hazardous and precursors of smog; carbon dioxide (a greenhouse gas); and carbon monoxide (a contributor to heart disease).

Credit Goals

- Size parking capacity to meet, but not exceed, minimum local zoning requirements OR health department regulatory authority, whichever is the overriding requirement, AND provide preferred parking for carpools or vanpools capable of serving 5% of the total building staff AND limit overall open-air paved vehicular circulation and parking area to 350 sf/stall.

OR

- For renovation projects, provide preferred parking and implement/document programs and policies for carpools and/or vanpools capable of serving 5% of the total building staff and add no new parking.

Documentation

- Provide local zoning or health department requirements, as applicable.
- Compile a description, parking plan, and supporting public outreach literature describing carpool and/or vanpool programs designed to serve 5% of the total building staff. Indicate preferred parking locations for carpools and vanpools. Prepare annual summary on carpool and vanpool usage.
- For renovation projects, prepare a pre-renovation parking plan and a post-renovation parking plan demonstrating that no new parking capacity was added and that preferred parking policies for carpools and/or vanpools capable of serving 5% of the total building staff are adopted.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Minimize parking lot and garage size. Consider sharing parking facilities with adjacent buildings and implementing staff carpool and vanpool programs. Consider instituting shuttle bus services for staff members who live in the neighborhood, or to link with bus or rail lines.

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1 point

SS Credit 5.1

Reduced Site Disturbance**: Protect or Restore Open Space**

Intent

Conserve, preserve and enhance existing natural areas and restore damaged areas to provide habitat for native flora and fauna and promote biodiversity.

Health Issues

Healthy ecosystems promote healthy people by maintaining health-promoting qualities of air and water systems. By minimizing site disruption associated with construction practices, the health of these ecosystems can be protected. Health care facilities should protect and enhance the site's existing natural areas as a therapeutic resource. Research shows that physical and visual connections to the natural environment provide significant social, psychological and physical benefits for patients, staff and visitors.

Credit Goals

- On greenfield sites, limit site disturbance including earthwork and clearing of vegetation to 40 feet beyond the building perimeter, 15 feet beyond primary roadway curbs, 8 feet beyond walkways, 10 feet from the centerline of main utility trenches, and 10 feet beyond constructed areas with permeable surfaces (such as pervious paving areas, stormwater detention facilities and playing fields) that require additional staging areas. Protect and encourage the development of native vegetation. Native plants are those species that occur naturally in the particular region, state, ecosystem, and habitat without direct or indirect human actions.

OR

- On previously developed sites, restore a minimum of 50% of the site area (excluding the building footprint) by replacing impervious surfaces with emphasis on native and limited use of adapted vegetation. Insure that no adapted vegetation is a known invasive species. Native plants are those species that occur naturally in the particular region, state, ecosystem, and habitat without direct or indirect human actions.

Documentation

q On Greenfield sites, compile a site disturbance plan demonstrating that site disturbances (including earthwork and clearing of vegetation) has been limited to 40 feet beyond the building perimeter, 15 feet beyond primary roadway curbs, 8 feet beyond walkways, 10 feet from the centerline of main utility trenches and 10 feet beyond constructed areas with permeable surfaces. Prepare a Site Protection Plan and specifications, by civil engineer or responsible party, noting limits of construction, disturbance, protection and enhancement measures.

OR

q On previously developed sites, obtain a narrative describing restoration and re-vegetation of degraded habitat areas, including use of native and non-invasive adapted vegetation. Obtain highlighted site drawings with area calculations demonstrating that 50% of remaining open areas have been restored.

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Credit 5.1 continued

Reduced Site Disturbance: **Protect or Restore Open Space**

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Perform a site survey to identify site elements and adopt a master plan for development of the project site. Select a suitable building location and design the building with the minimal footprint to minimize site disruption. Strategies include stacking the building program, tuck-under parking and sharing facilities with neighbors.

Other strategies include locating the loading dock underneath the building and locating helipads on top of the building or as a component of other paved surface areas, such as a section of the parking lot, where possible, to reduce site disturbance. Establish clearly marked construction boundaries and provide adequate protection measures to minimize disturbance of existing site and restore previously degraded areas to their natural state. Other methods include protection of existing vegetation by protecting clusters or groupings of existing vegetation (i.e. tree or shrub masses) rather than isolated plant material in order to minimize unnecessary ground disturbance (topsoil stripping) and removal of existing groundcover.

Coordinate habitat, wetland, and stream preservation programs with erosion control and stormwater management goals, including soil bioengineering technologies. Adopt rehabilitation, restoration, and reclamation strategies for the site's watershed management.

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1 point

SS Credit 5.2

Reduced Site Disturbance: **Development Footprint**

Intent

Conserve, preserve and enhance existing natural areas and restore damaged areas to provide habitat for native flora and fauna and promote biodiversity.

Health Issues

Healthy ecosystems promote healthy people by maintaining balance in air and water systems, and by minimizing construction site disruption. Health care facilities can protect and enhance the site's existing natural areas as a therapeutic resource. Research shows that physical and visual connections to the natural environment provide social, psychological and physical benefits for patients, staff and visitors.

Credit Goals

- Reduce the development footprint (defined as entire building footprint, access roads and parking) so that open space on the site exceeds the local zoning requirement by 25%. For areas with no local zoning requirements (e.g., some university campuses and military bases), dedicate open space area adjacent to the building that is equal to the development footprint.

Documentation

q Compile a copy of the local zoning requirements highlighting the criteria for open space. Prepare a calculation demonstrating that the open space exceeds the local zoning open space requirement for the site by 25%.

OR

q For areas with no local zoning requirements, dedicate open space area adjacent to the building that is equal to the development footprint. Prepare a letter from the property owner stating that the dedicated open space will be conserved for the life of the building.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Perform a site survey to identify site elements and adopt a master plan for development of the project site. Select a suitable building location and design the building with the minimal footprint to minimize site disruption. Strategies include stacking the building program, tuck-under parking and loading docks, and sharing facilities with neighbors. Establish clearly marked construction boundaries to minimize disturbance of existing site and restore previously degraded areas to their natural state.

Coordinate habitat, wetland, and stream preservation programs with erosion control and stormwater management goals, including soil bioengineering technologies. Adopt rehabilitation, restoration, and reclamation strategies for the site's watershed management.

Health care facilities often contain provisions for helipads, which impact site development footprint. Consider locating the helipad on a rooftop or as a component of other paved surface area (a section of the parking lot) where possible to reduce site disturbance.

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1 point

SS Credit 6.1

Stormwater Management: **Rate and Quantity**

Intent

Limit disruption to channel stability and pollution of natural water flows by implementing a channel protection strategy.

Health Issues

Controlling stormwater run-off lessens contamination of receiving waters thereby reducing opportunities for human and wildlife exposure to waterborne pollutants, bacteria, and toxic chemicals that are linked to a variety of health effects including cancer, birth defects, and nervous system disorders.

Credit Goals

- If existing imperviousness is less than or equal to 50%, establish a stormwater management plan that protects downstream channel stability using a recognized channel protection strategy [e.g., Ontario's Distributed Run-off Control (***Final Stormwater Management Planning and Design Manual,*** Ontario Ministry of the Environment 1999) or Maryland's Channel Protection Volume (***Maryland Stormwater Design Manual, Vol. I & II,*** MDE 2000)]. At a minimum, the channel protection strategy shall prevent the post-development 2-year, 24-hour peak discharge rate from exceeding the pre-development 2-year, 24-hour peak discharge rate.

OR

- If existing imperviousness is greater than 50%, establish a stormwater management plan that results in a 25% decrease in the rate and quantity of run-off from the 1-year, 24-hour design storm.

Documentation

- q Prepare calculations demonstrating that: (1) existing site imperviousness is less than or equal to 50%; and (2) a recognized channel protection strategy has been implemented; identify the recognizing authority.
- q Prepare calculations demonstrating that the stormwater management strategies result in at least a 25% decrease in the rate and quantity of run-off from the 1-year, 24-hour design storm. Include calculations demonstrating that existing site imperviousness exceeds 50%.

Reference Standards

United States Environmental Protection Agency's (EPA's) Guidance Specifying Management Measures for Sources of Nonpoint- Pollution in Coastal Waters, January 1993 (Document No. EPA-840-B-92-002), www.epa.gov/OW.

Potential Technologies & Strategies

Design the project to maintain natural stormwater flows by using alternative surfaces (e.g., green roofs, pervious paving, vegetative filter strips) and promoting infiltration. Significantly reduce impervious surfaces, maximize on-site stormwater infiltration, and retain pervious and vegetated areas. Harvest and reuse stormwater run-off from impervious areas of the building for non-potable uses such as landscape irrigation. Consider permeable paving materials in the context of overall accessibility and the degree of mobility of the building users.

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1 point

SS Credit 6.2

Stormwater Management: **Treatment**

Intent

Limit disruption of natural water flows by reducing stormwater run-off, increasing on-site infiltration and eliminating contaminants.

Health Issues

Controlling stormwater run-off lessens contamination of receiving waters thereby reducing opportunities for human exposure to waterborne pollutants, bacteria and toxic chemicals that are linked to cancer, birth defects, and nervous disorders.

Credit Goals

- Establish a stormwater treatment systems plan that maintains annual groundwater recharge rates by promoting nonstructural practices and infiltration and captures and treats the run-off volume from either 90% of the average annual rainfall or 1" (2.54 cm) of rainfall. Structural Best Management Practices (BMPs) used to treat run-off shall be designed to remove 80% of the average annual post development total suspended solids load (TSS) and 40% of the average annual post-development total phosphorus load (TP) based on the average annual loadings from all storms less than or equal to the 2 year/24 hour design storm. Do so by implementing Best Management Practices (BMPs) outlined in Chapter 4, Part 2 (Urban Run-off), of the United States Environmental Protection Agency's (EPA's) Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, January 1993 (Document No. EPA-840-B-92-002) or the local government's BMP document (whichever is more stringent).

Documentation

- [ ] Compile plans, drawings, and calculations demonstrating that the design complies with or exceeds EPA or local government Best Management Practices (whichever is more stringent) for removal of total suspended solids and total phosphorous.

Reference Standard

United States Environmental Protection Agency's (EPA's) Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, January 1993 (Document No. EPA-840-B-92-002), www.epa.gov/OW.

Potential Technologies & Strategies

Use alternative surfaces (e.g., green roofs, pervious paving) and nonstructural practices (e.g., rain gardens, bio-swales, vegetative filter strips, disconnected impervious surfaces) to reduce imperviousness and promote infiltration. Use environmentally sensitive design strategies (e.g., Low Impact Development, Maryland Stormwater Design Manual) to design mechanical or natural treatment systems to treat the site's stormwater. Utilize biologically based and innovative stormwater management features for pollutant load reductions such as constructed wetlands, filters and open channels to treat stormwater run-off. Coordinate habitat, wetland, and stream preservation programs with erosion control and stormwater management goals, including soil bioengineering technologies. Adopt rehabilitation, restoration, and reclamation strategies for the site's watershed management.

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1 point

SS Credit 7.1

Heat Island Effect: **Non-Roof**

Intent

Reduce heat islands (thermal gradient differences between urban developed and undeveloped areas) to minimize impact on microclimates and human and wildlife habitat.

Health Issues

Mitigating the heat island effect results in lowering ground level temperatures near buildings thereby reducing conditions favorable for ground-level ozone (smog) formation that can lead to respiratory illness. In addition, a cooler microclimate reduces a building's cooling load, thereby curbing reliance on fossil-fuel generated electricity, and reducing associated particulate and greenhouse gas emissions.

Credit Goals

- Provide shade (within 5 years) and/or use light-colored, high-albedo and/or open grid pavement with a Solar Reflectance Index (SRI) of at least 30 for at least 30% of the site's hardscape including parking areas, walkways, plazas, fire lanes, roads, etc..

OR

- Place a minimum of 50% of parking spaces underground or covered by structured parking.

OR

- Use an open grid pavement system (less than 50% impervious for a minimum of 50% of the parking lot area.

Documentation

q Compile a site plan and develop calculations demonstrating areas of hardscape including paving, walking areas, plazas, fire lanes, etc. and landscaping (list species) and building footprint, and declaring that:

- A minimum of 30% of non-roof impervious surfaces areas are constructed with high-albedo materials and/or open grid pavement and/or will be shaded within five years. The SRI must be calculated in accordance with ASTM E 1989-98 for the hardscape and have a minimum SRI of 30. Reflectance values used to calculate SRI are based on field measurements based on ASTM E1918-97 procedure. Emissivity values used to calculate SRI are based on Table 1 or field measurements using ASTM E 408-71 procedure.

OR

- A minimum of 50% of parking spaces have been placed underground or are covered by structured parking.

OR

- An open-grid pavement system (less than 50% impervious) has been used for a minimum of 50% of the parking lot area.

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Table 1

Material	Initial Solar Reflectance	3-year Solar Reflectance	Emissivity	Initial Solar Reflectance Index (SRI)	3-year Solar Reflectance Index (SRI)
Asphalt Paving-new	0.04	0.12	0.9	0	8.7
Asphalt Paving=aged 5+years	0.12	N/A	0.9	8.7	N/A
Chip-Seal w 0.28 albedo aggregate[1]	0.28	0.20	0.9	29	18.8
Gray Portland Cement Concrete[1]	0.35[b]	0.2[b]	0.88	36	17
White Portland Cement Concrete[1]	0.7[b]	0.4[b]	0.88	85	44

[1] Reflectance must be field verified using ASTM E1918-97 procedure.

[a] From Kreith, F., "Principles of Heat Transfer," Intext Educational Publishers, New York, 1973.

[b] American Concrete Pavement Association, "Concrete Pavement Research & Technology Update." Number 3.05, June 2002.

[c] Calculated value based on characteristics of each material.

[d] ASHRAE Handbook of Fundamentals, 2001.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Employ strategies, materials and landscaping techniques to reduce heat absorption of exterior materials. Shade constructed surfaces on the site with landscape features (native or non-invasive, climate tolerant trees and large shrubs, vegetated trellises, or other exterior structures supporting vegetation) and minimize the overall building footprint. Consider replacing constructed surfaces (i.e., roads, sidewalks) with vegetated surfaces such as gardens and open grid paving or specify light-colored, high-albedo materials to reduce the heat absorption.

Resources

Pomerantz, M., Akbari, H., and Chang, S.C., "The Effect of Pavements' Temperature on Air Temperatures in Large Cities," Lawrence Berkeley National Laboratory Report No. LBNL- 43442, Berkeley, CA.

1 point

SS Credit 7.2

Heat Island Effect: **Roof**

Intent

Reduce heat islands (thermal gradient differences between developed and undeveloped areas) to minimize impact on microclimate and human and wildlife habitat.

Health Issues

Mitigating the heat island effect results in lowering ground level temperatures near buildings thereby reducing conditions favorable for ground-level ozone (smog) formation that can lead to respiratory illness. In addition, a cooler microclimate reduces a building's cooling load, thereby curbing reliance on fossil-fuel generated electricity, and reducing associated particulate and greenhouse gas emissions.

Credit Goals

- Specify Energy Star® compliant (highly reflective) AND high emissivity roofing (emissivity of at least 0.9 when tested in accordance with ASTM 408) roofing having a Solar Reflectance Index (SRI) as required in Table 2 for a minimum of 75% of the roof surface.

Table 2

Roof Type	Slope	SRI
Low-Sloped Roof	≤ 2:12	78
Steep-Sloped Roof	> 2:12	76

OR

- Install a "green" (vegetated) roof for at least 50% of the roof area. Combinations of high albedo SRI roof and vegetated roof can be used if they meet in combination the Total Roof Area ≤ ((Area of SRI Roof * 1.33) + (Area of vegetated roof * 2)).

Documentation

q Document that the roof complies with the following requirements:

- The SRI is equal or greater than the value required in Table 2 for the building's specified roof type.
- Reflectance values used to calculate SRI are based on values from product ratings from the Cool Roof Rating Council's (CRRC) *Directory of Rated Products* or the U.S. EPA Energy Star Program's *Rated Products* list or Independent Laboratory testing in accordance with ASTM E903-96 for homogeneous, non-patterned materials having both specular and diffused optical properties OR ASTM E1084 for inhomogeneous, patterned, or corrugated materials OR field measurements using ASTM E1918-97 procedure.
- Emissivity values used to calculate SRI are based upon product ratings from the CRRC's *Directory of Rated Products* OR field measurements using ASTM E 408-71 procedure.
- 75% of the building's total roof area meets the applicable SRI requirement in Table 2.

OR

- Prepare calculation indicating Total Roof Area ≤ ((Area of SRI Roof * 1.33) + (Area of vegetated roof * 2)) demonstrating compliance using combined approaches.

OR

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SS Credit 7.2 continued

Heat Island Effect: **Roof**

- Prepare photographs and calculations demonstrating that vegetated roof areas constitute at least 50% of the total roof area, and prepare maintenance plan for the vegetated roof system.

Reference Standards

EPA Energy Star Roofing Guidelines, United States Environmental Protection Agency, Energy Star®, www.energystar.gov.

ASTM E408-71(1996)e1 - Standard Test Method For Total Normal Emittance Of Surfaces Using Inspection-Meter Techniques, www.astm.org,

Potential Technologies & Strategies

Employ strategies, materials and landscaping techniques that reduce heat absorption of exterior materials. Explore the use of new coatings, roof materials and colorants to achieve reflectance and emissivity values. Use photovoltaic cells for roof shading.

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1 point

SS Credit 8

Light Pollution Reduction

Intent

Eliminate light trespass from the building and site, improve night sky access, and reduce development impact on nocturnal environments.

Health Issues

Light pollution has been found to have a potential link to hormone production, specifically related to melatonin and possibly estrogen levels in women. Light-related decreases in melatonin and increased estrogen levels may be causally related. Increases in estrogen levels in women are linked to breast cancer.

Credit Goals

- Meet or provide lower light levels than those recommended by the Illuminating Engineering Society of North America (IESNA) *Recommended Practice Manual: Lighting for Exterior Environments* (RP-33-99). Meet uniformity ratios recommended by IESNA *Recommended Practice Manual: Lighting for Exterior Environments (RP-33-99)*.
- Design exterior lighting such that all exterior luminaires with more than 1000 initial lamp lumens are shielded and all luminaires with more than 3500 initial lamp lumens meet the Full Cutoff IESNA Classification.
- Assure that the maximum candela value of all interior lighting falls within the building (not out through windows) and the maximum candela value of all exterior lighting falls within the property.
- Assure that any luminaire within a distance of 2.5 times its mounting height from the property boundary has shielding such that no light from that luminaire crosses the property boundary.
- Zone and control lights to allow for limiting night-time lighting to the Emergency Department, a small employee parking area, a small visitor parking area, pedestrian walkways, and circulation routes.

Documentation

q Compile a brief exterior lighting system narrative describing the lighting objectives and the measures taken to meet the ambient light and direct beam illumination requirements.

q Compile an electrical site plan showing the zoning of the light fixtures and the control system for the fixtures.

Reference Standards

Illuminating Engineering Society of North America (IESNA) *Recommended Practice Manual: Lighting for Exterior Environments* (RP-33-99), www.iesna.org.

Potential Technologies & Strategies

Adopt site lighting criteria to maintain safe light levels while avoiding off-site lighting and night sky pollution. Minimize site lighting where possible and model the site lighting using a computer model. Technologies to reduce light pollution include full cutoff luminaires, low-reflectance surfaces and low-angle spotlights.

1 point

SS Credit 9

Connection to the Natural World: **Places of Respite**

Intent

Provide places of respite on the health care campus to connect health care patients, visitors, and staff to the natural environment.

Health Issues

Health care facility design should address the physical, emotional, and spiritual needs of the patients and/or residents, family members, visitors and staff that inhabit these buildings. Privacy, confidentiality, security, dignity, comfort, orientation, and connection to nature are key elements and issues that need to be addressed in the design of supportive environments.

Places of respite connected to the natural environment are key elements in defining a supportive, high performance healing environment with proven effects on patient and staff well-being and improved clinical outcomes. A growing body of research indicates that patients and medical staff benefit from access to daylight and landscape views. Providing a variety of spaces for patients, families, and caregivers to pause and experience their natural surroundings is an important programming and design objective.

Credit Goals

- Establish 5% of the net usable program area as specifically programmed places of respite with direct connection to the natural environment, conveniently located and easily accessible and identifiable to patients, visitors, and staff. Provide at least one place of respite dedicated to staff and separate from patients and visitors.
- Provide at least one outdoor place of respite conveniently located and easily accessible and identifiable to patients and visitors. Provide at least one outdoor place of respite dedicated to staff that is easily accessible and is designated non-smoking.

Documentation

- ☐ Compile floor plans highlighting places of respite.
- ☐ Compile building program and calculation showing the 5% credit goal has been met.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Select appropriate locations for places of respite, taking into account architectural and engineering factors (structural loads, etc.); environmental factors (winds, orientation, views, etc.); programs of care (Horticultural Therapy, etc.); the needs of specific patient populations (immune suppression, sunlight sensitivity, etc.) and realistic levels of maintenance. Consider issues of wayfinding and orientation, accessibility, strength and stamina, activity and interest, privacy, independence. Provide choice and variety in the design of spaces (for example, spaces that engage all the senses but also areas with limited sensory stimulation). Consider a variety of smaller spaces conveniently located throughout the facility rather than one large space.

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SS Credit 9 continued

Connection to the Natural World: **Places of Respite**

Strategies include on-grade and rooftop gardens; arrival, interior atrium and greenhouse gardens; universal access path systems; sitting areas or vestibules or wide corridors that offer views of nature and places to pause and/or adjacent destination and display areas of flora and fauna. Consider the development of on-grade gardens and green spaces that will also help integrate the facility into the surrounding community. Coordinate the integration of gardens and nature for interior and exterior environments with the facility's Infectious Disease Control Specialist. This includes addressing concerns of chemical sensitivities and allergens with certain high-pollen plant materials.

Places of respite may include family consultation spaces, lounges, cafés, grieving rooms, meditation spaces or chapels, resource areas and libraries. Designated staff break areas, exercise spaces, and resource areas may be considered. To qualify, these spaces must have direct connection to the natural environment and must be spaces where no medical intervention or direct medical care is delivered. Direct connection to the natural environment includes views of distant and nearby nature (such as inaccessible rooftop spaces with "green" (vegetated) roofs and mature street trees).

In development of room data sheets or project space programs, include criteria for orientation relative to major exterior views and other natural features (daylight, seasonal variations, sound of water).

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1 point

SS Credit 10.1

Community Contaminant Prevention: **Airborne Releases**

Intent

Minimize building airborne effluents and environmental, safety, and health impacts to site and neighbors.

Health Issues

Health care facilities include laboratories, pharmacies, and diagnostic services, which generate substances toxic to patients, staff, visitors, and the neighboring communities. Human health effects associated with exposure to airborne toxicants, particulates, gases, and bioaerosols may include respiratory diseases (e.g., asthma, hypersensitivity pneumonitis, bronchitis); cardiovascular events (e.g., sudden death associated with particulate air pollution), among others, depending on exposure levels.

Credit Goals

- Exceed by 10% the NIH-CDC Guidelines for Airborne Effluent from Laboratories that Handle Biohazards (CDC-NIH Biosafety in Microbiological and Biomedical Laboratories, latest edition (currently May 1999).
- Meet all standards of California South Coast Air Quality Management District for all products of combustion.

Documentation

- q Obtain documentation from the mechanical engineer of record that the NIH-CDC Guidelines for Airborne Effluent from Laboratories that Handle Biohazards have been exceeded by 10% and all California South Coast Air Quality Management District standards for products of combustion have been met.

Reference Standards

National Institutes for Health - CDC Guidelines for Airborne Effluent from Laboratories that Handle Biohazards (CDC-NIH Biosafety in Microbiological and Biomedical Laboratories, latest edition (currently May 1999).

California South Coast Air Quality Management District, www.aqmd.gov.

Potential Technologies & Strategies

Provide scrubbers and filters for boilers and diesel generators.

Test and certify all filters as installed prior to occupancy and placard them for at least annual recertification.

Burn fuels low in sulfur content. Provide air quality abatement equipment for equipment that burns fossil fuels.

Burn bio-diesel fuels in lieu of fossil fuels.

Substitute ground-cooled heat exchanger for cooling tower to eliminate biohazard from cooling water.

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1 point

SS Credit 10.2

Community Contaminant Prevention: **Airborne Releases**

Intent

Prevent releases of hazardous chemicals and fuels to storm sewer.

Health Issues

Health care facilities store and manage chemicals in both underground tanks and other outdoor facilities. Along with run-off from parking areas, these are significant potential sources of surface and groundwater contamination. By minimizing potential exposure, health care facilities can contribute to protecting the health of the surrounding community.

The reference standards cited below are more stringent than many local and state regulatory thresholds and are designed to ensure that contamination risks associated with chemical storage are reduced.

Credit Goals

- Establish oil interceptors at all drains from parking areas and central plant areas.
- Comply with California Health & Safety Code Section 25290.1 and 25291 for the installation of fuel oil storage tanks to prevent release of diesel fuels.

Documentation

- q Compile design documentation of on-site fuel oil storage system(s).
- q Compile a plan indicating the location of all storage facilities, and a narrative describing secondary containment provisions.

Reference Standards

California Health & Safety Code Section 25290.1 and 25291, http://www.leginfo.ca.gov/cgi-bin/calawquery?codesection=hsc.

Title 40, Code of Federal Regulations, Part 112 (for spill control and countermeasures).

Potential Technologies & Strategies

Ensure that storage facilities include secondary containment provisions to prevent unintentional spills and leakage from contaminating aquifers and stormwater.

Provide oil interceptors at all drains from parking areas and from central plant areas.

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Water Efficiency

Required — WE Prerequisite 1

Potable Water Use for Equipment Cooling

Intent

Eliminate potable water use for equipment cooling.

Health Issues

Maintaining adequate potable water supplies is a basic necessity for the health of individuals and communities. Only about 1% of the water on Earth is fresh water. Processing potable water is energy intensive and thus contributes to air emissions associated with fossil fuel energy generation (for the treatment, pumping and maintenance of the potable water systems). Only about 20% of current urban water is used for drinking and sanitary purposes, with the other 80% not requiring treatment to potable standards. Using reclaimed water for selected applications can reduce costs and preserve precious potable water supplies. To protect the public health, a dual or dedicated distribution system must be installed to segregate potable and reclaimed water for health, product and process purposes.

Credit Goals

- Do not use potable water for once through cooling for any equipment. (This credit does not apply to potable water for cooling tower makeup, or for other evaporative cooling systems; refer to WE Credit 4 for Process Water Use Reduction.)

Documentation

- q Compile documentation of technologies employed to eliminate "once-through" use of potable water for all equipment cooling purposes.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Use closed-loop cooling water for equipment cooling instead of open-loop (once-through). Often, cooling of equipment is considered a critical application, where redundancy is desired to significantly reduce or eliminate the possibility of a loss of cooling. When using closed-loop cooling systems for critical applications (i.e. where failure of equipment due to loss of cooling would result in danger to patients or medical personnel, damage to equipment, loss of medical information, or other significant adverse impacts), owners should utilize multiple pieces of cooling equipment (n+1 redundancy). Where this is not possible, an owner may elect to use potable water in an open-loop (once-through) configuration as the *emergency back-up* cooling system only. Such emergency back-up systems shall only be used in the event that the primary closed-loop cooling equipment has failed, and such a failure is visually and audibly indicated at the point of use and alarmed at a continuously monitored location.

Use non-potable water sources for once-through cooling applications.

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1 point

WE Credit 1.1

Water Efficient Landscaping: **Reduce Potable Water Use by 50%**

Intent

Limit or eliminate the use of potable water for landscape irrigation.

Health Issues

Maintaining adequate potable water supplies is a basic necessity for the health of individuals and communities. Only about 1% of the water on Earth is fresh water. Processing potable water is energy intensive and thus contributes to air emissions associated with fossil fuel energy generation (for the treatment, pumping and maintenance of the potable water systems). Only about 20% of current urban water is used for drinking and sanitary purposes, with the other 80% not requiring treatment to potable standards. Using reclaimed water for selected applications can reduce costs and preserve precious potable water supplies. To protect the public health, a dual or dedicated distribution system must be installed to segregate potable and reclaimed water for health, product and process purposes.

Native landscapes can dramatically lower irrigation requirements, with little if any supplemental irrigation required after plant establishment, and attract native wildlife, birds, and insects, creating a building site integrated with its natural surroundings.

Credit Goals

- Reduce potable water consumption from irrigation by at least 50% over conventional means. Landscaped area must include a minimum of one-half acre outside of the building. Do not use water from wells or rivers for site irrigation purposes.

Documentation

q Prepare calculations substantiating that potable water consumption for irrigation has been reduced by 50%. Use calculation methodology as described in LEED v2.1 Reference Guide (pages 84 – 88) Include a brief narrative of the equipment used and/or the use of native plants or non-invasive drought-tolerant plants.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Perform a soil and climate analysis to determine appropriate landscape types and design the landscape with indigenous plants to reduce or eliminate irrigation requirements. Use high-efficiency irrigation systems and consider using stormwater, recycled site water and/or greywater for irrigation.

Specify and install a roof-water or groundwater collection system. Use metal, clay, or concrete based roofing materials and take advantage of gravity water flows whenever possible. Roofing materials made of asphalt or with lead-containing materials contaminate collected rainwater and render it unsuitable. Check with local regulatory authorities regarding the collection of rainwater as there may be local regulations governing rainwater collection and reuse.

High efficiency irrigation strategies include micro-irrigation systems, moisture sensors, clock timers, and weather database controllers. These systems are significantly more water efficient than conventional irrigation systems.

1 point in addition to WE 1.1

WE Credit 1.2

Water Efficient Landscaping: **No Potable Water Use or No Irrigation**

Intent

Limit or eliminate the use of potable water for landscape irrigation.

Health Issues

Maintaining adequate potable water supplies is a basic necessity for the health of individuals and communities. Only about 1% of the water on Earth is fresh water. Processing potable water is energy intensive and thus contributes to air emissions associated with fossil fuel energy generation (for the treatment, pumping and maintenance of the potable water systems). Only about 20% of current urban water is used for drinking and sanitary purposes, with the other 80% not requiring treatment to potable standards. Using reclaimed water for selected applications can reduce costs and preserve precious potable water supplies. To protect the public health, a dual or dedicated distribution system must be installed to segregate potable and reclaimed water for health, product and process purposes.

Native landscapes can dramatically lower irrigation requirements, with little if any supplemental irrigation required after plant establishment, and attract native wildlife, birds, and insects, creating a building site integrated with its natural surroundings.

Credit Goals

- Use only captured rain or recycled site water to eliminate all potable water consumption for site irrigation (except for initial watering to establish plants). Landscaped area must include a minimum of one-half acre outside of the building. Do not use water from wells or rivers for site irrigation purposes.

OR

- Do not install permanent landscape irrigation systems.

(Note that earning this credit automatically earns WE Credit 1.1)

Documentation

q Obtain documentation verifying that the project site will not use potable water for irrigation (except for initial watering to establish plants). Include a narrative describing the captured rain system, the recycled site water system, and their holding capacity. List all the plant species used. Include calculations demonstrating that irrigation credit goals can be met from captured rain or recycled site water.

OR

q Document that the project site does not have a permanent landscape irrigation system. Include a narrative describing how the landscape design allows for this.

Reference Standards

There is no reference standard for this credit.

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WE Credit 1.2 continued

Water Efficient Landscaping: **No Potable Water Use or No Irrigation**

Potential Technologies & Strategies

Perform a soil and climate analysis to determine appropriate landscape types and design the landscape with indigenous plants to eliminate irrigation requirements.

Specify and install a roof-water or groundwater collection system. Use metal, clay, or concrete based roofing materials and take advantage of gravity water flows whenever possible. Roofing materials made of asphalt or with lead-containing materials contaminate collected rainwater and render it unsuitable. Check with local regulatory authorities regarding the collection of rainwater, as there may be local regulations governing rainwater collection and reuse. Harvest non-potable building water for site irrigation through use of on-site storage tanks, equipped with filters and pumps as appropriate.

1 point

WE Credit 2

Innovative Wastewater Technologies

Intent

Reduce generation of wastewater and potable water demand while increasing the local aquifer recharge.

Health Issues

Maintaining adequate potable water supplies is a basic necessity for the health of individuals and communities. Only about 1% of the water on Earth is fresh water. Conventional wastewater systems require significant volumes of water to convey waste to municipal wastewater treatment facilities. Replacing potable water used for sewage conveyance with greywater and/or captured rainwater, or significantly reducing or eliminating potable water use through the installation of waterless or ultra-low flow fixtures, preserves precious potable water sources. Processing potable water is energy intensive and thus contributes to air emissions associated with fossil fuel energy generation (for the treatment, pumping and maintenance of the potable water systems). Only about 20% of current urban water is used for drinking and sanitary purposes, with the other 80% not requiring treatment to potable standards. Using reclaimed water for selected applications can reduce costs. To protect the public health, a dual or dedicated distribution system must be installed to segregate potable and reclaimed water for health, product and process purposes.

Credit Goals

- Reduce the use of municipally provided potable water for building sewage conveyance by a minimum of 50%.

OR

- Treat 100% of wastewater on site to tertiary standards.

Documentation

q Prepare calculations and a narrative describing the measures used to reduce wastewater by at least 50% from baseline conditions. Use Energy Policy Act of 1992 fixture flow rates for the baseline case. Use calculation methodology as described in LEED v2.1 Reference Guide (pages 95 - 97).

OR

q Obtain documentation verifying that 100% of wastewater will be treated to tertiary standards on site. Include narrative describing the on-site wastewater treatment system.

Reference Standards

Tertiary Standard is the highest form of wastewater treatment and includes removal of organics, solids and nutrients as well as biological or chemical polishing, to effluent limits of 10 mg/L BOD5 and 10 mg/L TSS.

Potential Technologies & Strategies

Specify ultra-low flow fixtures and dry fixtures such as composting toilets and waterless urinals to reduce wastewater volumes.

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WE Credit 2 continued

Innovative Wastewater Technologies

Develop a wastewater inventory and determine areas where greywater can be used for functions conventionally served by potable water. These might include toilets, irrigation, and other non-patient contact applications such as cooling tower makeup. Consider reusing stormwater or greywater for sewage conveyance or on-site wastewater treatment systems (mechanical and/or natural).

The construction of artificial wetlands for wastewater treatment can be incorporated on multiple scales, from individual buildings to campus wide facilities. As wastewater moves through the wetlands, plants and microbes naturally remove water contaminants. An alternative technology is aquaculture, where contaminants in the wastewater are food for fish and plants.

Resources

Constructed Wetlands for Wastewater Treatment and Wildlife Habitat: 17 case studies, EPA 832/B-93-005, 1993.

2 points

WE Credit 3

Domestic Potable Water Use Reduction

Intent

Maximize potable water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems.

NOTE: This credit refers to domestic potable water use. For reduction of potable water use in cooling and process applications, refer to WE Credit 4, Process Water Use Reduction. For reduction of potable water uses in irrigation, refer to WE Credit 1, Water Efficient Landscaping.

Health Issues

Maintaining adequate potable water supplies is a basic necessity for the health of individuals and communities. Only about 1% of the water on Earth is fresh water. Processing potable water is energy intensive and thus contributes to air emissions associated with fossil fuel energy generation (for the treatment, pumping and maintenance of the potable water systems). Only about 20% of current urban water is used for drinking and sanitary purposes, with the other 80% not requiring treatment to potable standards. Using reclaimed water for selected applications can reduce costs. To protect the public health, a dual or dedicated distribution system must be installed to segregate potable and reclaimed water for health, product and process purposes.

Credit Goals

- **Credit 3.1 (1 credit)** Employ strategies that in aggregate use 20% less water than the water use baseline calculated for the building (not including irrigation or process uses) after meeting the Energy Policy Act of 1992 fixture performance requirements.
- **Credit 3.2 (1 credit)** Employ strategies that in aggregate reduce water usage by an additional 10% (total 30%) from the water use baseline calculated for the building (not including irrigation or process uses) after meeting the Energy Policy Act of 1992 fixture performance requirements.

Documentation

- Prepare the spreadsheet calculation demonstrating that water-consuming fixtures specified for the stated occupancy and use of the building reduce occupancy-based potable water consumption by the specified percentage compared to baseline conditions.
- Maintain cut sheets for all water consuming fixtures necessary for the occupancy use of the building, with water conservation specifications highlighted.

Reference Standards

The Energy Policy Act (EPACT) of 1992, http://tis.eh.doe.gov/nepa.

Potential Technologies & Strategies

Estimate the potable and non-potable water needs for the building. Develop a water use inventory in conjunction with WE Credit 2 that includes all water consuming fixtures (not including irrigation or process uses), and use this to identify significant potable water demands and determine methods to minimize or eliminate these demands. Use Energy Policy Act of 1992 fixture flow rates for the baseline case. (Use calculation methodology as described in LEED v2.1 Reference Guide (pages 103-106).)

WE Credit 3 continued

Domestic Potable Water Use Reduction

Use high-efficiency fixtures, dry fixtures such as composting toilets and waterless urinals, and occupant sensor controls to reduce potable water demand. Consider reuse of stormwater or greywater for non-potable applications such as toilet and urinal flushing, mechanical systems (see WE Credit 4.2) and custodial uses.

Water-efficient shower heads are available that require less than 2.5 GPM. Lavatory faucets are typically used only for wetting purposes and can be effective with as little as 1.0 GPM. Water-saving faucet aerators can be installed that do not change the feel of the water flow. Specify self-closing, slow-closing or electronic sensor faucets, particularly in high-use public areas where it is likely that faucets may be carelessly left running. Water closets are a significant user of potable water. There are a number of toilets that use considerably less than 1.6 GPF, including pressure-assisted toilets and dual flush toilets that have an option of 0.8 GPF or 1.0 GPF.

1 point

WE Credit 4.1

Process Water Use Reduction: Measurement and Verification

Intent

Provide for the ongoing accountability and optimization of building water consumption performance over time.

Health Issues

Approximately 70% of the potable water consumption in health care facilities is attributable to process water uses, compared to less than 30% consumed for “domestic” use. Maintaining adequate potable water supplies is a basic necessity for the health of individuals and communities. Only about 1% of the water on Earth is fresh water. Processing potable water is energy intensive and thus contributes to air emissions associated with fossil fuel energy generation (for the treatment, pumping and maintenance of the potable water systems).

Credit Goals

- Provide for long term continuous measurement of potable water uses within the facility.
- Meter the following water uses (as applicable to the project):
  - Water use in laboratory
  - Water use in dietary department
  - Water use in central sterile and processing department
  - Water use in laundry
  - Water use in radiology and imaging department
  - Water use in surgical suite
  - Purified water system (reverse osmosis and/or de-ionized) and filter backwash water
  - Outdoor irrigation systems
  - Cooling tower make-up and filter backwash water
  - Steam boiler system make-up water
  - Closed loop hydronic system make-up water

Documentation

q Compile a Measurement & Verification Plan with summary schedule of the instrumentation and controls for the required monitoring categories, highlighting the I/O data points to be collected.

q Document the monitoring system, including cut sheets of sensors and the data collection system.

Reference Standards

International Performance Measurement and Verification Protocol Volume 1, 2001 Version, http://www.ipmvp.org/.

Potential Technologies & Strategies

Design the building with equipment to measure water performance. Submeter potable water systems. Use measured system data to identify opportunities for reduced use of potable water.

1 point

WE Credit 4.2

Process Water Use Reduction: Low or No Water Use Building System Equipment

Intent

Reduce or eliminate the use of potable water for non-potable process use in building system equipment.

Health Issues

Approximately 70% of the potable water consumption in health care facilities is attributable to process water uses, compared to less than 30% consumed for "domestic" use. Maintaining adequate potable water supplies is a basic necessity for the health of individuals and communities. Only about 1% of the water on Earth is fresh water. Processing potable water is energy intensive and thus contributes to air emissions associated with fossil fuel energy generation (for the treatment, pumping and maintenance of the potable water systems).

Credit Goals

- Use building system equipment (pumps, compressors, cooling towers, etc) that reduce the use of potable water by at least 10% in comparison to that of comparable equipment that use potable water for a process use. Minimum water savings must be at least 100,000 gallons annually.

Documentation

- ❑ Compile a spreadsheet listing all new or renovated building system equipment that would conventionally use potable water for process use (cooling, seal, backwash, etc.). Compare with similar equipment that reduces or eliminates the use of potable water for process use. Calculate annual water savings for the use of this equipment.

OR

- ❑ Compile construction drawings showing system components and arrangements for collection of air conditioning condensate, stormwater runoff, or other site non-potable water for use in cooling tower makeup.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Specify equipment with low or no usage of potable water (e.g., waterless vacuum pumps and air compressors, mechanical seals on pumps, drift eliminators on cooling towers, combination sensible and evaporative cooling towers, cooling tower water centrifugal separators, demand controlled or closed circuit condensate coolers)., Compare water use by equipment that has low or no potable water use with comparable equipment (e.g. water seal vacuum pumps versus waterless, or cooling tower sidestream centrifugal separators versus sand filters) – substantial (10% or more) process potable water use reduction by building mechanical system or medical equipment is easily achieved.

Design systems to capture air handling system condensate for use in non-potable applications such as cooling tower makeup or irrigation.

Energy & Atmosphere

Required **EA Prerequisite 1**

Fundamental Building Systems Commissioning

Intent

Verify and ensure that fundamental building elements and systems are designed, installed and calibrated to operate as intended.

Health Issues

Commissioning verifies the efficient and effective operations of a building's mechanical systems, thus ensuring compliance with indoor air quality and thermal comfort design criteria, and lessening dependence on natural resources resulting in improved outdoor air quality and reduced greenhouse gas emissions.

Credit Goals

- Establish or have a contract in place to establish the following best practice commissioning procedures:
- Engage a commissioning team that does not include individuals directly responsible for project design or construction management.
- Review the design intent and the basis of design documentation.
- Incorporate commissioning requirements into the construction documents.
- Develop and utilize a commissioning plan.
- Verify installation, functional performance, training and operation and maintenance documentation.
- Complete a commissioning report.

Documentation

- Document that the fundamental commissioning requirements have been successfully executed or will be provided under existing contract(s).

Reference Standard:

There is no reference standard for this credit.

Potential Technologies and Strategies

Engage a commissioning authority and adopt a commissioning plan. Include commissioning requirements in bid documents and task the commissioning authority to produce a commissioning report once commissioning activities are completed. Hospitals and health care systems with in-house expertise in design and commissioning may perform this work. However, this is extremely specialized expertise and the Owner may benefit from engaging a credentialed Commissioning Authority.

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Required

EA Prerequisite 2

Minimum Energy Performance

Intent

Establish the minimum level of energy efficiency for the base building and systems.

Health Issues

Lower building energy use results in reduced combustion of fossil fuels for source energy generation. Energy efficiency benefits health by reducing emissions from the products of combustion, including less particulates and pollutants, which in turn help to improve outdoor air quality. Greenhouse gas emissions, which contribute to global climate change, are also reduced.

Credit Goals

Many codes applicable to health care facilities have requirements that preclude the building from meeting ASHRAE 90.1 requirements. This section has been designed to allow a building baseline computation that recognizes regulatory context. This credit distinguishes between buildings regulated by health code requirements which exempt them from all or portions of local energy code requirements, from those that are required to meet local energy codes.

- For acute care hospitals, long term care facilities or freestanding surgery centers with regulatory requirements that are exempt from all or portions of the local energy code, design to meet or exceed the baseline energy performance as defined below under Documentation.

- For buildings not exempted from any portion of the local energy codes, design to meet building energy efficiency and performance as required by the local energy code or ASHRAE/IESNA 90.1-2004, which ever is more stringent.

- For all buildings, create an estimate of whole building energy consumption as defined below under Documentation, and determine the Energy Performance Rating for your facility design using EPA's Target Finder rating tool.

- This prerequisite may not be appropriate for small renovations that do not significantly affect the fundamental energy systems for the area. This prerequisite can be applied to renovations that substantially alter the fundamental energy systems.

Documentation

q For acute care hospitals, long term care facilities or freestanding surgery centers with regulatory requirements that are exempt from all or portions of the local energy code:

  - Model anticipated building energy performance in accordance with ASHRAE 90.1-2004 Appendix G as modified by the Design Assumptions in GGHC Appendix 1, using DOE2.1E or Energy Plus.
  - Demonstrate that the proposed building performance meets the ASHRAE 90.1-2004 Energy Cost Budget.

q For acute care hospitals, long term care facilities or freestanding surgery centers, medical office buildings, clinics or health care buildings not exempted from any portion of the local energy codes:

  - Prepare calculations verifying that the building complies with ASHRAE/IESNA 90.1-2004 using the Energy Cost Budget Method, or local energy codes. If local energy codes were applied, demonstrate that the local code is equivalent to, or more stringent than, ASHRAE/IESNA 90.1-2004 .

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EA Prerequisite 2 continued

Minimum Energy Performance

- Prepare a summary table of design features that minimally comply with applicable mandatory requirements in ASHRAE/IESNA 90.1-2004, Sections 5-10, or local energy codes.

q For all buildings, calculate anticipated whole building energy performance using DOE2.1E or Energy Plus modeling results. Use the Process Loads Procedures and Assumptions listed in Appendix 1 to create a whole building energy consumption estimate from the results of the modeling.

q Determine the Energy Performance Rating for your facility design using EPA's Target Finder rating tool. The GGHC is exploring new methods and tools for increasing energy performance in the design stage. We strongly request that projects submit the Statement of Energy Design Intent generated by Target Finder and a detailed description of the proposed building to:

GGHC Research Project; Center for Maximum Potential Building Systems; 8604 FM 969, Austin, TX 78724.

(Note: while the GGHC process, including this point, is both voluntary and self-certifying, your submission of this data will greatly inform the process of improving future versions of this document.)

Reference Standards

EPA National Energy Performance Rating System, www.energystar.gov/benchmark

EPA Target Finder new design rating tool, www.energystar.gov/newbuildingdesign

ASHRAE Handbook, HVAC Applications, Chapter 7 Health Care Facilities, Specific Design Criteria, www.ashrae.org

ASHRAE/IESNA 90.1–2001 Energy Standard for Buildings, Except Low Rise Residential, www.ashrae.org

AIA Guidelines for Design and Construction of Health Care Facilities, 2001 Edition, www.aia.org

2003 Savings By Design Health Care Modeling Procedures, Pacific Gas and Electric Company, www.gghc.org/Documents/PGEModProc.pdf

Potential Technologies & Strategies

Design building systems to maximize energy performance while maintaining or improving health and safety requirements. Consider the following strategies as regionally appropriate:

Use energy (latent and sensible) recovery.

Ground source heat pumps.

Use evaporative cooling when ambient conditions allow.

Reduce outside airflow during unoccupied periods.

Expand unoccupied temperature dead band by automatically resetting zone temperature set points based on occupancy.

Separate HVAC zones with constant airflow, temperature and humidity control requirements from those with single or double shift occupancy that would allow reductions in air changes or setbacks in temperature and humidity.

Provide a cooling system with at least two cooling loops operated at different temperatures. This can be accomplished with separate chillers (or direct tower cooling).

Design for high part-load heating and cooling efficiency.

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EA Prerequisite 2 continued

Minimum Energy Performance

Daylighting decreases energy costs for buildings by providing natural solar lighting. A well-designed daylit building is estimated to reduce lighting energy use by 50 to 80% and reduce the associated HVAC energy used to remove the heat of electric lighting from 10 to 20%. Overall power density can be reduced as much as 30%, resulting in lower capital costs for power and HVAC systems. Daylighting should be implemented in health care facilities with the special needs of the building occupants in mind.

Design high efficiency chiller plants that use various technologies and strategies to reduce overall plant energy consumption at full and part loads (such as chillers with variable speed drives on the compressors, primary-only variable flow pumping, series-counterflow chiller arrangements, etc.).

Use low leakage air handling units to reduce overall fan horsepower while ensuring that air is properly filtered.

Use a computer simulation model to assess the energy performance and identify the most cost effective energy efficiency measures. Quantify whole building energy performance as compared to a baseline building and to an annual energy performance target, if available.

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Required

EA Prerequisite 3

CFC Reduction in HVAC&R Equipment

Intent

Reduce ozone depletion.

Health Issues

Stratospheric ozone layer depletion leads to increased exposure to ultraviolet radiation, increasing risk factors for skin cancer and immune system depression. The United States is one of the world's largest emitters of ozone depleting substances. As part of the US commitment to implementing the Montreal Protocol, the EPA has implemented regulations relative to the responsible management of CFCs, including programs to end the production of ozone depleting substances.

Credit Goals

- Zero use of CFC-based refrigerants in new base building HVAC&R systems. When reusing existing base building HVAC equipment that currently uses CFC refrigerants, create and implement a comprehensive CFC phase-out plan.

Documentation

- q Document that the building's HVAC&R systems do not use CFC based refrigerants.
- q For existing buildings, compile a listing of all existing HVAC&R components and state whether each component uses CFCs. For those components that use CFCs, prepare a phase out plan describing how these components will be converted or removed and replaced with CFC-free components before construction is complete.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

When reusing existing HVAC systems, conduct an inventory to identify equipment that uses CFC refrigerants and adopt a replacement schedule for these refrigerants. For new buildings, specify new HVAC equipment that uses no CFC refrigerants.

Resources

EPA, Stratospheric Ozone Protection: Moving to Alternative Refrigerants
http://es.epa.gov/program/epaorgs/oar/altrefrg.html.

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8 points

EA Credit 1

Optimize Energy Performance

Intent

To achieve increasing levels of energy performance to reduce environmental impacts associated with excessive energy use.

Health Issues

Lower building energy use results in reduced combustion of fossil fuels for source energy generation. Energy efficiency benefits health by reducing emissions from the products of combustion, including less particulates and pollutants, which in turn help to improve outdoor air quality. Greenhouse gas emissions, which contribute to global climate change, are also reduced.

Credit Goals

- Model anticipated building energy performance using DOE2.1E or Energy Plus in accordance with the instructions provided in Prerequisite 2.
- For buildings that are not exempt from local energy codes, compare performance of the proposed building systems with the baseline building systems in accordance with ASHRAE 90.1-2004 Appendix G.
- For buildings that are exempt from all or portions of the local energy code, compare performance of the proposed building systems with the baseline building systems as described in Prerequisite 2.
- This credit may not be appropriate for small renovations that do not significantly affect the fundamental energy systems for the area. This credit can be applied to renovations that substantially alter the fundamental energy systems.

Point total	Exempt health care buildings	All other buildings
	Compared with baseline described in EA prerequisite 2	Compared to ASHRAE 90.1
Credit 1.1 (1 point)	Reduce design energy consumption by 5%	Reduce design energy cost by 10%
Credit 1.2 (2 points)	Reduce design energy consumption by 10%	Reduce design energy cost by 15%
Credit 1.3 (3 points)	Reduce design energy consumption by 15%	Reduce design energy cost by 20%
Credit 1.4 (4 points)	Reduce design energy consumption by 20%	Reduce design energy cost by 25%
Credit 1.5 (5 points)	Reduce design energy consumption by 25%	Reduce design energy cost by 30%
Credit 1.6 (6 points)	Reduce design energy consumption by 30%	Reduce design energy cost by 35%
Credit 1.7 (7 points)	Reduce design energy consumption by 35%	Reduce design energy cost by 40%
Credit 1.8 (8 points)	Reduce design energy consumption by 40%	Reduce design energy cost by 45%

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EA Credit 1 continued

Optimize Energy Performance

Documentation

- q Prepare a narrative documenting energy saving measures incorporated in the building design, including a table listing baseline and proposed comparisons of all model variables that are different.
- q Prepare calculations verifying the building energy consumption performance achieved by the proposed energy conservation measures.
- q Document anticipated whole building energy performance using the EPA's Target Finder design tool as described in EA Prerequisite 2.

Reference Standards

See EA Prerequisite 1.

Potential Technologies & Strategies

Design building systems to maximize energy performance while maintaining or improving health and safety requirements. Consider the following strategies as regionally appropriate:

- Use energy (latent and sensible) recovery.
- Use ground source heat pumps.
- Use evaporative cooling when ambient conditions allow.
- Reduce outside airflow during unoccupied periods.
- Expand unoccupied temperature dead band by automatically resetting zone temperature set points based on occupancy.
- Separate HVAC zones with constant airflow, temperature and humidity control requirements from those with single or double shift occupancy that would allow reductions in air changes or setbacks in temperature and humidity.
- Provide a cooling system with at least two cooling loops operated at different temperatures. This can be accomplished with separate chillers (or direct tower cooling).
- Design for high part-load heating and cooling efficiency.
- Design for daylighting to decrease energy costs for buildings by providing natural solar lighting. A well-designed daylit building is estimated to reduce lighting energy use by 50 to 80% and reduce the associated HVAC energy used to remove the heat of artificial lighting from 10 to 20%. Overall power density can be reduced as much as 30%, resulting in lower capital costs for power and HVAC systems. Daylighting should be implemented in health care facilities with the special needs of the building occupants in mind.
- Design high efficiency chiller plants that use various technologies and strategies to reduce overall plant energy consumption at full and part loads (such as chillers with variable speed drives on the compressors, primary-only variable flow pumping, series-counterflow chiller arrangements, etc.).
- Use low leakage air handling units to reduce overall fan horsepower while ensuring that air is properly filtered.

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3 points

EA Credit 2
Renewable Energy

Intent

Encourage use of renewable energy technologies to reduce fossil fuel energy use.

Health Issues

Providing renewably-based on-site electricity to fulfill a portion of a building's energy needs offsets the greenhouse gas and particulate emissions associated with fossil-fuel electrical generation.

Credit Goals

Supply a net fraction of the building's total energy use (as expressed as a fraction of annual energy use) with on-site renewable energy systems.

Point total	Renewable energy provided as fraction of annual energy use
Credit 2.1 (1 point)	1% contribution
Credit 2.2 (2 points)	2% contribution
Credit 2.3 (3 points)	5% contribution

Documentation

q Obtain calculations demonstrating that the required percentage of total energy use is supplied by renewable energy system(s).

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Assess the project for renewable energy potential including: solar (PV and active thermal), wind, geothermal, biomass (including biodiesel), hydro, and biogas strategies.

Note that ground source heat pumps do not count as geothermal, and that passive solar for domestic water or space heating is included under EA Credit 1 for Optimize Energy Performance.

When applying these strategies, take advantage of "net metering" with the local utility.

Version 2.0a *Pilot*
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1 point

EA Credit 3

Additional Commissioning

Intent

Verify and ensure that the entire building is designed, constructed and calibrated to operate as intended.

Health Issues

Commissioning verifies the efficient and effective operations of a building's mechanical systems, thus ensuring compliance with indoor air quality and thermal comfort design criteria, and lessening dependence on natural resources resulting in improved outdoor air quality and reduced greenhouse gas emissions.

Credit Goals

In addition to the Fundamental Building Commissioning prerequisite (EA Prerequisite 1), implement or have a contract in place to implement the following additional commissioning tasks:

- Contract with a commissioning authority independent of the design team to review:
    - The design prior to the construction document phase.
    - The construction documents near completion of the construction document development and prior to issuing the contract documents for construction.
    - The contractor submittals relative to systems being commissioned.
- Provide the Owner with a single manual that contains the information required for re-commissioning building systems.
- Have a contract in place to review building operation with O&M staff, including a plan for resolution of outstanding commissioning-related issues within one year after construction completion date.

Documentation

- Document that the required additional commissioning tasks have been successfully executed or will be provided under existing contracts.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

EA Prerequisite 1 establishes the framework of an effective commissioning program. The Additional Commissioning credit ensures peer review through independent, third party verification. Engage the commissioning authority early in the design phase. The three design credit goals must be executed by a firm that is not on the design team (an "independent" Commissioning Authority). This requirement acts to avoid conflicts of interests and bias. It is recommended that the same independent Commissioning Authority deliver the two re-commissioning tasks, although it is not required. Hospitals and health care systems with in-house expertise in design and commissioning may perform this work. However, this is extremely specialized expertise and the owner may benefit from engaging a credentialed Commissioning Authority.

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1 point

EA Credit 4

Refrigerant Selection

Intent

Reduce ozone depletion and global warming effects through the proper selection of refrigerants for use in chillers.

Health Issues

Use of halocarbons in refrigerants in HVAC equipment has direct impact on stratospheric ozone layer depletion, which increases exposure to ultraviolet radiation, a risk factor for skin cancer. These refrigerants also have an indirect effect in energy use and the production of greenhouse gases and increased global warming.

Credit Goals

- Install base building level HVAC and refrigeration equipment with combined low ozone depletion and global warming potential.

Documentation

- Document that HVAC&R systems use refrigerants that meet the credit goals for leakage, ozone depletion and global warming potential as described in this credit.

Reference Standards

Select a refrigerant that complies with the following equation where the terms are ozone depletion potential (*ODP* – expressed as equivalent pounds of refrigerant CFC11 per year); global warming potential (*GWP* – pounds of carbon dioxide produced per year); annual refrigerant leakage rate (*Lr* – % of charge lost per year); end of life loss (*Mr* – % of total charge); refrigerant charge (*Rc* – pounds of refrigerant per ton of cooling); and equipment life (*Life* – in years).

$$\frac{Rc \times ((Lr \times Life) + Mr)}{Life} \leq \frac{100}{GWP + (100{,}000 \times ODP)}$$

Manufacturers' and suppliers' data must be supplied to document values of *Lr*, *Mr*, *Life*, and *Rc*. Values for *ODP* and *GWP* for typical refrigerants are provided in the table below.

Potential Technologies & Strategies

When renovating or adding on to existing buildings, inventory existing building HVAC systems to be reused and replace those system components that contain refrigerants that do not meet the credit goals. For new buildings, specify refrigeration systems that comply.

For instance, a 15-year life air conditioning unit that uses HCFC-22 must have extremely low leakage rates (Lr = 1% and Mr = 2%) and a very low refrigerant charge (1.5 pounds per ton) to meet the credit goal.

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EA Credit 4 continued

Refrigerant Selection

Values for ODP and GWP for typical refrigerants						
Refrigerant	ODP	GWP	Lr	Mr	Life (yr)	Rc (lb/ton)
CFC-11	1	4,600	1 to 3%	2 to 10%	20 to 35	2.0 to 2.4
CFC-12	0.82	10,600	1 to 3%	2 to 10%	20 to 35	2.5 to 3.0
CFC-114	0.94	9,800	1 to 3%	2 to 10%	20 to 35	1.4 to 3.3
CFC-500	0.605	7,900	1 to 3%	2 to 10%	20 to 35	1.4 to 3.3
CFC-502	0.221	4,600	1 to 3%	2 to 10%	20 to 35	1.4 to 3.3
HCFC-22	0.04	1,700	1 to 3%	2 to 10%	20 to 35	0.4 to 5.0
HCFC-123	0.02	120	1 to 3%	2 to 10%	20 to 35	1.4 to 3.3
HFC-23	0	11,700	1 to 3%	2 to 10%	20 to 35	1.4 to 3.3
HFC-125	0	2,800	1 to 3%	2 to 10%	20 to 35	1.4 to 3.3
HFC-134a	0	1,300	1 to 3%	2 to 10%	20 to 35	1.4 to 3.3
HFC-143a	0	3,800	1 to 3%	2 to 10%	20 to 35	1.4 to 3.3
HFC-227ea	0	2,900	1 to 3%	2 to 10%	20 to 35	1.4 to 3.3
HFC-236fa	0	6,300	1 to 3%	2 to 10%	20 to 35	1.4 to 3.3
HFC-245fa	0	950	1 to 3%	2 to 10%	20 to 35	1.4 to 3.3
HFC-404A	0	3,900	1 to 3%	2 to 10%	20 to 35	1.4 to 3.3
HFC-407C	0	1,700	1 to 3%	2 to 10%	20 to 35	1.4 to 3.3
HFC-410A	0	1,890	1 to 3%	2 to 10%	20 to 35	1.6 to 3.5
HFC-507A	0	3,900	1 to 3%	2 to 10%	20 to 35	1.4 to 3.3

Please note that the leakage rates, life and charge are suggested ranges. Please consult with manufacturers and suppliers to provide actual certified values.

Resources

Green Building Rating System for New Construction and Major Renovations (LEED-NC) Version 2.1, revised ed, 75 pp., Washington, DC: U.S. Green Building Council,

http://www.usgbc.org/Docs/LEEDdocs/LEED_RS_v2-1.pdf,2003.

"Class I ozone-depleting substances," http://www.epa.gov/ozone/ods.html, 2002.

"Class II ozone-depleting substances," http://www.epa.gov/ozone/ods2.html, 2002.

"Global warming potentials of ODS substitutes," http://www.epa.gov/ozone/geninfo/gwps.html, 2002.

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EA Credit 4 continued
Refrigerant Selection

Inventory of U.S. Greenhouse Gas Emissions and Sinks, 291 pp., Washington, DC: EPA 430-R-04-003, 2004
http://yosemite.epa.gov/oar/globalwarming.nsf/content/ResourceCenterPublicationsGHGEmissions.html.

United Nations Environmental Program, "UNEP Report of the Montreal Protocol Refrigeration, Air Conditioning and Heat Pumps Technical Option Committee," 2002.

United Nations Environmental Program, "Report of the TEAP Chiller Task Force (on CFC chillers and incentives/impediments to their replacement)," 2004.

J. Calm, "Comparative global warming impacts of electric vapor-compression and direct-fired absorption equipment," Electric Power Research Institute, Pleasant Hill, CA, EPRI 19TR-103297, 1993.

"Data maintained in the tracking system for compliance with the Montreal Protocol," Environmental Protection Agency, Global Programs Division, Washington, DC 2003.

Carbon Dioxide Emissions from the Generation of Electric Power in the United States, 21 pp., Washington, DC: Department of Energy and Environmental Protection Agency, 2000, http://www.eia.doe.gov/cneaf/electricity/page/co2_report/co2emiss.pdf.

P. Domanski, D. Didion, and J. Chi, "CYCLE D: NIST vapor compression cycle design program," National Institute of Standards and Technology, Gaithersburg, MD, NIST Standard Reference Database 49, version 2.0, 1999.

M. McLinden and S. Klein, "NIST thermodynamic and transport properties of refrigerants," National Institute of Standards and Technology, Gaithersburg, MD, NIST Standard Reference Database 23, 1998.

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1 point

EA Credit 5

Measurement & Verification

Intent

Provide for the ongoing accountability and optimization of building energy consumption performance over time.

Health Issues

Optimizing energy consumption reduces dependence on natural resources, contributing to healthy ecosystems and reducing the particulate and greenhouse gas emissions associated with fossil-fuel generated electricity.

Credit Goals

- Provide for long term continuous measurement of substantive energy uses within the facility (i.e. electrical loads greater than 100 KVA).
- At a minimum, provide metering for the following electrical and mechanical systems (as applicable to the scope of the project):
  - o Lighting system power and controls
  - o Motor loads (including air compressors, vacuum pumps and boiler systems)
  - o Chillers
  - o Data Centers
  - o Critical Equipment Electrical Distribution Systems
  - o Air distribution systems

Documentation

- q Prepare a Measurement & Verification Plan.
- q Include a summary schedule of the instrumentation and controls for the required monitoring categories, highlighting the I/O data points to be collected.
- q Document the monitoring system, including cut sheets of sensors and the data collection system.

Reference Standards

International Performance Measurement and Verification Protocol Volume 1, 2001 Version
http://www.ipmvp.org/.

Potential Technologies & Strategies

Model the energy systems to predict savings. Design the building with equipment to measure whole building energy performance. Draft a Measurement and Verification Plan to apply during building operation that compares predicted savings to those actually achieved in the field. Submeter electric systems. Use measured system data to analyze the performance of electrically driven equipment and systems (such as chiller performance at part loads, and operational profiles of variable flow fan and pump systems).

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4 points

EA Credit 6
Energy Supply Efficiency

Intent

Reduce the total non-renewable source energy required for the facility through increased energy supply efficiency.

Health Issues

Optimizing non-renewable energy consumption reduces dependence on natural resources, contributing to healthy ecosystems and reducing the particulate and greenhouse gas emissions associated with fossil-fuel generated electricity.

Credit Goals

- Calculate the total annual non-renewable source energy requirements for the facility as designed, using the calculated site energy requirements and the source conversion values provided in the table below. Calculate the percentage reduction in the total annual non-renewable source energy, achieved through the use of combined heat and power systems, or other methods of cascading energy recovery of primary fuel supplies (commonly known as "cogeneration").

Source conversion values	
Fuel Type	**Source kBTU per Site kBtu**
Electricity	3.013
Natural gas	1.024
Fuel oil	1
Steam	1.38
Hot Water	1

Local air emissions regulations must be met. This credit cannot be applied for fuel switching without the use of energy generation equipment.

Point total	Percentage reduction in annual non renewable source energy
Credit 6.1 (1 point)	Reduce source energy use by at least 10%
Credit 6.2 (2 points)	Reduce source energy use by at least 15%
Credit 6.3 (3 points)	Reduce source energy use by at least 17%
Credit 6.4 (4 points)	Reduce source energy use by at least 18%

Documentation

q Obtain verification from the responsible engineering design professional of the reduction through a chart showing the fuel calculations listed in the requirements as set forth in Federal Energy Regulatory Commission (FERC) 18 CFR 292 for certification of qualifying cogeneration facilities.

Reference Standards

Federal Energy Regulatory Commission (FERC) 18 CFR 292 on Qualifying Cogeneration and Small Power Production Facilities under Public Utility Regulatory Policies Act Of 1978 (PURPA) www.ferc.gov/docs-filing/hard-filing/form-556/part292.asp.

Potential Technologies & Strategies

Increased supply efficiency, such as through cascading heat use/recovery, leads to higher overall supply efficiency. An example is heat recovered from electricity generation to generate hot or cold thermal distribution fluids.

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1 point

EA Credit 7

Medical Equipment Efficiency

Intent

Reduce energy consumption by using efficient medical and other equipment.

Health Issues

Energy efficiency benefits health by reducing particulate and greenhouse gas emissions associated with fossil-fuel based electrical generation, thereby improving outdoor air quality and curbing global warming potential.

Credit Goals

- Use Energy Star® qualified equipment or equipment in the top 25th percentile for energy consumption for that class of equipment for at least 75% (quantity, not cost) of the new medical equipment that is not building systems related.

Documentation

- q Compile a listing of all medical equipment purchased and calculations demonstrating that the threshold percentage of Energy Star-qualified products is achieved.
- q Where Energy Star-qualified equipment is not yet available for an application, demonstrate reasonable effort to meet the 25th percentile criterion by identifying a minimum of three other equivalent models that meet the functional needs of the facility with higher energy consumption requirements. If there are less than three other functionally equivalent models available on the market, use the most efficient available.

Reference Standards

EPA's Energy Star® Program at http://www.energystar.gov.

Potential Technologies & Strategies

Purchase computers, related electronics, and office equipment that carry the Energy Star® label. Examples of these include:

- o Computers, Monitors Printers & Scanners
- o Copiers
- o DVD Products
- o Exit Signs
- o Refrigerators and Freezers
- o TVs & VCRs
- o Water Coolers

This is just a sampling of a steadily increasing list. Refer to EPA's Energy Star® Program at www.energystar.gov for an up to date list of product categories and models: http://www.energystar.gov/index.cfm?fuseaction=find_a_product.

Investigate availability of Energy Star® qualified products for medical equipment purchases, particularly those items that are purchased or leased in quantity or represent particularly high electric consumption. Do market survey for best 25 percent equipment where not yet available with Energy Star® labeling. Examples of the most important high load medical equipment to focus upon include:

- o Diagnostic imaging equipment (x-rays, MRIs, etc)
- o Sterilization
- o Physiological monitoring
- o Laundry
- o Dietary

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GGHC Appendix 1

Design Assumptions & Procedures for Modeling for the GGHC Energy Credits

The following design assumptions that differ from the requirements of ASHRAE 90.1-2004 Appendix G shall be used:

- Lighting levels – area category lighting power density values shall be as described in Table L-1 below. Use area categories from Table L-1 in combination with any valid area category from ASHRAE-90.1
- Indoor Design Conditions: in accordance with 1999 ASHRAE Handbook, HVAC Applications, Chapter 7 Health Care Facilities, Specific Design Criteria, or the requirements of the local jurisdiction, whichever is more stringent.
- Ventilation, air changes and air pressure relationships: Use specific ventilation rates, air changes, and pressure relationships, as required by authorities having jurisdiction. .If the authorities having jurisdiction have no specific requirements, use the requirements from 2001 AIA Guidelines for Design and Construction of Hospital and Health Care Facilities, or most recent version..
- Baseline Building HVAC Systems: The requirements of ASHRAE 90.1-2004, Appendix G, Section G4.2 shall be modified as follows: If the proposed building systems are Constant Air Volume or Variable Air Volume with devices to maintain pressure relationships at all times, the HVAC systems in the baseline building design shall be Constant Volume Systems with hot water (not electric) reheat. If the proposed building systems are Variable Air Volume without pressure tracking devices, then the HVAC systems in the baseline building design shall be Variable Air Volume with hot water (not electric) reheat.
- Plug Loads: See Occupancy Assumptions below.
- Process Ventilation loads: Special ventilation requirements in a health care facility are not unusual. While Tables OCC-1 quantifies the typical ventilation in a health care facility, spaces may occur that require higher ventilation rates. The higher ventilation rates shall be simulated in both the Baseline and Proposed building simulation runs, making this an energy neutral feature.
- Process Fan Loads: Any energy consumed by fans that are solely related to process uses (such as EtO exhaust and kitchen hood exhaust), where the fan does not run 24 hours per day, may be excluded from the analysis.
- Occupancy Assumptions: Table OCC-1 lists the default values that shall be used in both the Baseline and Proposed building simulations. Should the user choose to use a different value for any of these assumptions (except for the lighting baseline), based upon professional judgment, the same value will be used in both the Baseline and Proposed building simulations.
- Lighting Controls and Daylighting: Table D-1 below shows factors that may be used to reduce lighting power densities calculated by the area category method to account for the various lighting control strategies listed. Factors shall be used to reduce the calculated LPD by multiplying the LPD for the area affected by the relevant strategy by the sum of 1 minus the factor listed. This corrected area LPD can then be used in the area/category calculations.
- Occupancy Schedules: In accordance with ASHRAE 90.1-2004 guidelines.

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Table D-1 Lighting Power Savings Adjustments

TYPE OF CONTROL	TYPE OF SPACE	FACTOR	
Occupant sensor With separate sensor for each space	Any space <250 square feet enclosed by opaque floor-to-ceiling partitions; any size classroom, corridor, conference or waiting room	0.20	
	Rooms of any size that are used exclusively for storage	0.60	
	Greater than <250 square feet	0.10	
Dimming system			
Manual	Hotels/motels, restaurants, auditoriums, theaters	0.10	
Multiscene programmable	Hotels/motels, restaurants, auditoriums, theaters	0.20	
Tuning	Any space	0.10	
Automatic time switch control device	<250 square feet and with a timed manual override at each switch location required by §131 (a), and controlling only the lights in the area enclosed by ceiling-height partitions.	0.05	
Combined controls			
Occupant sensor with programmable multiscene dimming system	Hotels/motels, restaurants, auditoriums, theaters	0.35	
Occupant sensor with a separate sensor for each space used in conjunction with daylighting controls and separate sensor for each space	Any space <250 square feet within a daylit area and enclosed by opaque floor-to-ceiling partitions	0.10 (may be added to daylighting control credit)	
Automatic Daylighting Controls (Stepped/Dimming)			
	WINDOWS Window Wall Ratio		
Glazing Type	20%	20% to 40%	40%
VLT> 60%	0.20 0.30	0.30 / .040	0.40/0.40
VLT> 35 and < 60%	0/0	0.20/0.30	0.30/0.40
VLT< 35%	0/0	0/0	0.20/0.40
	SKYLIGHTS Percentage of Gross Exterior Roof Area		
Glazing Type	< 1%	1% to 3%	>3%
VLT > 60%	0/0.30	0.15/0.40	0.30/0.40
VLT>35 and < 60%	0/0.20	0/0.30	0.15/0.40
VLT < 35%	0/0.10	0/0.20	0/0.30

Notes for Table D-1:

1. From 2001 California Energy Efficiency Standards Non-residential Manual, August 2001, Table 5-10.

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Table OCC-1 Area Occupancy Assumptions

Space Function	Occupant Density[1] (people / 1000 ft^2)	Sensible (Btu/h / person)	Latent (Btu/h / person)	Receptacle Power[1] (W/ft^2)	Service Water Heating[1] (Btu/h-person)	Lighting Power Density[2] (W/ft^2)	Minimum O.A. [3] (CFM/ft^2)	Operating Schedule [1] (Table 7.1.C)
Anesthesia Storage	5	250	213	1.00	0	3.0	1.20	H
Angiographic-All Other Types	5	250	213	1.00	600	3.0	0.30	H
Angiographic-Heart Only	5	250	213	1.00	600	3.0	0.75	H
Autopsy	5	250	213	1.00	600	1.2	0.30	H
Bathroom/ Public	3.3	250	250	0.10	0	0.6	0.15	H
Bedpan Room	5	250	213	0.10	600	0.5	0.15	H
Cast Room	5	250	213	1.00	600	3.0	0.30	H
Clean Linen Storage	1	250	250	0.10	0	0.5	0.30	H
Clean Utility / Workroom	5	250	213	2.00	215	1.2	0.30	H
Conference Rooms	20	245	155	0.10	150	1.2	0.50	H
Corridors	10	250	250	0.10	0	0.6	0.30	H
Cystoscopy	5	250	213	1.00	600	3.0	0.75	H
Darkroom	5	250	213	1.00	600	0.3	0.30	H
Decontamination	5	250	213	1.00	600	1.2	0.30	H
Delivery Room	5	250	213	1.00	1000	4.5	0.75	H
Dietary Day Storage	2	250	250	0.10	0	0.5	0.30	H
Dining Room	10	275	275	0.10	300	1.1	1.50	B
Dishwashing	5	275	475	1.00	215	1.7	0.30	H
Endoscopy	5	250	213	1.00	600	3.0	0.30	H
Histology	5	150	213	1.00	600	4.5	0.30	H
Isolation	5	250	213	1.00	300	0.5	0.30	H
Janitors Closet / Utility	1	250	250	0.10	0	0.5	1.50	H
Kitchen, Food Preparation	5	275	475	1.00	400	1.7	0.30	B
Labor/ Delivery/Recovery	5	250	213	1.00	1000	4.5	0.30	H
L / D / R / Post Partum	5	250	213	1.00	1000	0.7	0.30	H
Laboratory	5	250	213	1.00	600	3.0	0.30	H
Linen Storage, Clean	2	250	250	0.10	0	0.5	0.30	H
Lobby	10	250	250	0.10	100	1.1	0.15	H
Lockers	10	250	250	0.25	0	0.7	0.15	H
Mammography	5	250	213	1.00	600	3.0	0.30	H
Mechanical Equipment Room	0.5	250	250	0.10	0	0.7	0.15	H
Medical Records	2	250	250	0.10	0	3.0	0.15	H
Nuclear Medicine, Hot Lab	5	250	213	1.00	600	1.2	0.30	H
Nursery, General	5	250	213	1.00	300	3.0	0.45	H
Nursery, Exam	5	250	213	1.00	300	0.7	0.45	H
Nursing Stations- General	5	250	213	0.25	150	1.2	0.15	H
Operating Room	5	250	213	1.00	1000	4.5	0.75	H
Pathology	5	250	213	1.00	600	3.0	0.30	H
Patient Room	5	245	155	1.00	300	0.5	0.30	H
Pharmacy / Medicine Room	5	250	213	1.00	150	3.0	0.30	H
Physical Therapy and Hydrotherapy	5	250	213	1.00	150	1.2	0.30	C
Recovery	5	250	213	1.00	300	3.0	0.30	H
Scrub Up Area, Surgical Corridor	5	250	213	1.00	1000	4.5	0.30	H
Soiled Linen, Sorting	5	250	213	1.00	600	1.2	1.50	H
Special Procedure Room, Diagnostic	5	250	213	1.00	600	3.0	0.30	H
Special Procedure Room, Invasive	5	250	213	1.00	600	3.0	0.75	H
Stairways	1	250	213	0.10	0	0.6	0.15	H
Sterilizer Room	5	250	213	1.00	600	1.2	1.50	H
Sub-Sterile	5	250	213	1.00	600	0.7	0.30	H

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Space Function	Occupant Density[1] (people / 1000 ft^2	Sensible (Btu/h / person)	Latent (Btu/h / person)	Receptacle Power[1] (W/ft^2)	Service Water Heating[1] (Btu/h-person)	Lighting Power Density[2] (W/ft^2)	Minimum O.A. [3] (CFM/ft^2)	Operating Schedule [1] (Table 7.1.C)
Surgical Supply	5	250	213	1.00	0	1.2	0.30	H
Trash Chute Room	0.5	250	250	0.10	0	0.5	1.50	H
Trauma	5	250	213	1.00	600	3.0	0.75	H
Treatment / Examination	5	250	213	1.00	300	1.2	0.30	C
Unsterile Supply	2	250	250	1.00	0	0.5	0.30	H
Waiting Areas/Lounges	10	250	250	0.10	0	1.1	0.15	H
X-ray, Diagnostic and Treatment	5	250	213	1.00	600	3.0	0.30	H

Notes for Table OCC-1

(1) From ASHRAE/IESNA 90.1-2001 ECB Supplement Tables 7.1A & 7.1B
(2) See Table L-1
(3) From 1998 California Mechanical Code when listed, otherwise from California ACM Manual Table 2-2.

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Table L-1 Area Category Method

Baseline Lighting Power Density Values(watts/sf) by Primary Function For Hospital / Healthcare				
Anesthesia Storage	3.0		Lockers	0.7
Angiographic-All Other Types	3.0		Mammography	3.0
Angiographic-Heart Only	3.0		Mechanical Equipment Room	0.7
Autopsy	1.2		Medical Records	3.0
Bathroom	0.6		Nuclear Medicine, Hot Lab	1.2
Bedpan Room	0.5		Nursery, Exam	3.0
Cast Room	3.0		Nursery, General	0.7
Clean Linen Storage	0.5		Nursing Stations	0.7
Clean Utility / Workroom	1.2		Operating Room	4.5
Conference Rooms	1.2		Pathology	3.0
Corridors	0.6		Patient Room	0.5
Cystoscopy	3.0		Pharmacy / Medicine Room	3.0
Darkroom	0.3		Physical Therapy and Hydrotherapy	1.2
Decontamination	1.2		Recovery	3.0
Delivery Room	4.5		Scrub Up Area, Surgical Corridor	4.5
Dietary Day Storage	0.5		Soiled Linen, Sorting	1.2
Dining Room	1.1		Special Procedure Room, Diagnostic	3.0
Dishwashing	1.7		Special Procedure Room, Invasive	3.0
Endoscopy	3.0		Stairways	0.6
Histology	4.5		Sterilizer Room	1.2
Isolation	0.5		Sub-Sterile	0.7
Janitors Closet / Utility	0.5		Surgical Supply	1.2
Kitchen, Food Preparation	1.7		Trash Chute Room	0.5
Labor/Delivery/Recovery	4.5		Trauma	3.0
L / D / R / Post Partum	0.7		Treatment / Examination	1.2
Laboratory	3.0		Unsterile Supply	0.5
Linen Storage, Clean	0.5		Waiting Areas/Lounges	1.1
Lobby	1.1		X-ray. Diagnostic and Treatment	3.0

From Pacific Gas & Electric's 2003 Savings By Design Healthcare Modeling Procedures

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Process Loads Procedures:

- Remove the process load energy consumption calculated in the model used to demonstrate that the proposed building performance meets the ASHRAE 90.1-2004 Energy Cost Budget.
- Add in the process loads. Create an estimate of whole building process load usage or use the area category method, selecting load densities from Table P-1 below. Multiply the load density for an area by the operating hours per year for that area, and sum up all the areas to obtain the annual process energy consumption to be added to the modeling results for the HVAC, lighting, and service water heating energy consumption.
- Process Fan Loads: Add in an estimate of process fan loads.

Table P-1 Process Load Densities

Space Function	Process Equipment Average Watts/sf	Process Steam Average W/sf
Imaging Department or area	8	0
Emergency Department	3	0
Full-Service Kitchen	2	5
Surgical Suite	3	0
Radiation Therapy (linear accelerator and simulator room)	15	0
ICU/CCU	1	0
Nursing Units	½	0
Central Sterile	5	0
Cath Labs	5	0
Laundry	½	10
Labs	3	0

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Materials & Resources

Required **MR Prerequisite 1**

Storage and Collection of Recyclables

Intent

Reduce solid waste disposal in landfills and incinerators generated by health care facilities through reduction, reuse, recycling and composting.

Health Issues

A 1998 Memorandum of Understanding between the U.S. EPA and the American Hospital Association targeted a 33% reduction in solid waste to landfill or incineration by 2005; 50% by 2010. As hospitals develop environmentally preferable purchasing standards and implement recycling programs to achieve this goal, the spatial and programming implications associated with these goals must be considered. More than 50% of a hospital's waste stream is composed of the materials addressed in this credit. Diverting a building's operational waste stream constituents from landfilling and incineration reduces the need to extract virgin natural resources, saves energy, reduces emissions associated with new production and transportation, and reduces potential groundwater contamination from landfills and toxic air emissions from incineration.

Credit Goals

- Establish a collection system and controlled areas serving the entire building dedicated to the separation, storage, and collection of materials for recycling including (at a minimum) newsprint, paper, corrugated cardboard, glass, plastics, metals, fluorescent lamps (tube, compact fluorescent and HID) and batteries.

Documentation

- ❑ Compile a Waste Management Plan, highlighting the types and volumes of waste generated and identifying those that can be handled by the recycling program.
- ❑ Compile a Functional Program showing the area(s) dedicated to recyclable material collection and storage. Demonstrate that the area(s) dedicated to recycling are controlled and that both the controlled areas and collection system are appropriately sized to accommodate the building users' recycling needs.

Reference Standards

There is no reference standard for this prerequisite.

The American Hospital Association (AHA) and the United States Environmental Protection Agency (EPA) signed a Memorandum of Understanding (MOU) identifying goals to reduce the impact of health care facilities on the environment. A primary goal is the reduction of the health care solid waste stream. http://www.h2e-online.org/about/mou.htm.

Other credits relevant to the AHA/EPA MOU include MR Prerequisite 2 (Mercury Elimination), MR Credits 2.1 & 2.2 (Construction Waste Management) and MR Credit 8.2 PBT Elimination: Mercury Use in Equipment).

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MR Prerequisite 1 continued

Storage and Collection of Recyclables

Potential Technologies & Strategies

The Waste Management Plan should stipulate the categories and volumes of waste for recycling. The functional program should include the space requirements associated with the waste management plan, and include centralized recycling collection and storage spaces. Determine size of spaces based upon volume of projected waste and length of anticipated storage. At loading docks or other waste removal areas, include space for compactors and balers for recycling cardboard waste. Staging areas for sharps containers and recycling containers must be included to facilitate efficient operation of the recycling program. Secure storage should be provided for fluorescent lamps and batteries to minimize risk of mercury contamination.

Resources

Healthy Hospitals: Environmental Improvements through Environmental Accounting, Tellus Institute, Boston, MA under US EPA Cooperative Agreement X 821580-01-0, 2000.

Memorandum of Understanding between the American Hospital Association and the U.S. EPA, kEPA-742-F-99-018, http://www.h2e-online.org/about/mou.htm.

National Recycling Coalition www.nrc-recycle.org.

For space programming data, see the following resources:

California Integrated Waste Management Board www.ciwmb.ca.gov.

US EPA, Business Guide for Reducing Solid Waste - Volume To Weight Conversion Table appendices http://yosemite.epa.gov/R10/OWCM.NSF/recycle/vol_wght.

Architectural Graphic Standards, 10th Edition, pp.942-43.

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Required

MR Prerequisite 2

Mercury Elimination

Intent

Eliminate stand alone mercury-containing building products and reduce mercury discharge through product substitution and capture.

Health Issues

In 1998, a Memorandum of Understanding between the American Hospital Association and the US EPA set new goals for hospital pollution prevention. One of the top priorities was the virtual elimination of mercury and mercury-containing devices from the hospital waste stream by the year 2005. Mercury is a potent neurotoxin. The most sensitive health effect of mercury is an adverse impact on the neurological development of fetuses, infants and children. Low-level prenatal exposure can result in language, memory and attention deficits in children who were exposed in-utero. Hospitals have substantially reduced the purchase of mercury containing chemicals and medical devices and found substitutes for many pharmaceuticals. To achieve virtual elimination of mercury from the waste stream, however, requires the phasing out and recycling of mercury containing building products, such as thermostats, switches, batteries, and lamps, for mercury recovery.

Credit Goals

- Eliminate specification and use of thermostats, switches and other stand-alone mercury containing measurement devices in building control systems.
- Specify and install low mercury fluorescent tubes and compact fluorescent lamps, and low mercury high intensity discharge bulbs such that average mercury content in fluorescent tubes and compact fluorescent lamps does not exceed 5 mg of mercury, and that high-intensity discharge lamps have the lowest available mercury content, providing that all other performance specifications are met.
- Demolition plans shall include a plan for capture of historical mercury sources, including but not limited to piping infrastructure. Collection of any mercury devices shall be designated for recycling and preclude overseas donation/disposal.
- In facilities delivering dental care, install amalgam separation devices.

Documentation

- ☐ Document that the facility is free of mercury containing devices (excepting lamps and any devices mandated by Federal law), and that any dental facilities have installed amalgam separators that meet or exceed the standard ISO-11143.
- ☐ Compile a copy of the Waste Management Plan highlighting the types of mercury containing devices in use that are handled by the recycling program and disposal methods for captured mercury. Include dental wastes, including scrap amalgam, chair side traps, and separator wastes.
- ☐ Compile a demolition plan which requires collection of all mercury containing switches, devices and fluorescent lamps to ensure their safe storage and recycling, and include a construction protocol for the management of historical mercury sources and/or spills.

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MR Prerequisite 2 continued

Mercury Elimination

- q Maintain purchasing records and technical data on lamps associated with initial occupancy verifying that the average mercury concentration for all fluorescent tubes and compact fluorescent lamps does not exceed 5 mg.
- q Verify that high-intensity discharge lamps are purchased with the lowest mercury content, providing that all other performance specifications are met.

Reference Standards

The American Hospital Association (AHA) and the United States Environmental Protection Agency (EPA) signed a Memorandum of Understanding identifying goals to reduce the impact of health care facilities on the environment. A primary goal included the virtual elimination of mercury waste from the health care waste stream by the year 2005. http://www.h2e-online.org/about/mou.htm

Other credits relevant to the AHA/EPA MOU include MR Prerequisite 1 (Storage and Collection of Recyclables), MR Credits 2.1 & 2.2 (Construction Waste Management) and MR Credit 8.2 PBT Elimination: Mercury Use in Equipment).

A variety of state laws prohibiting some or all uses of mercury-containing building products have been enacted. These include but are not limited to:

- Maine State law (LD 1159) prohibits the sale of mercury in switches, measuring devices (including sphygmomanometers), instruments and thermostats.
- Washington State law (House Bill 1002) requires the labeling of fluorescent lamps that contain mercury. Prohibits the sale of mercury-containing items in products such as thermometers and thermostats.
- Connecticut State law (House Bill 5539) bans the sale and distribution of mercury fever thermometers and places restrictions on the sale of other mercury-containing equipment.
- California State law (SB 633) restricts the use and distribution of mercury fever thermometers and other uses.
- Oregon State law (HB 3007) phases out mercury thermostats and prohibits the sale of fever thermometers and other uses.

Potential Technologies & Strategies

Advances in lighting technology have greatly reduced the per lamp mercury concentrations. Low mercury, high intensity discharge lamps are increasingly available. Consider long life, low mercury lamps to reduce costs associated with relamping, recycling and purchase. Very low mercury fluorescent induction lighting, with instant on–off control, offering reduced energy usage and long life.

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1 point

MR Credit 1.1

Building Reuse: **Maintain 40% of Existing Walls, Floors and Roof**

Intent

Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to manufacturing and transport of the materials.

Health Issues

Current health care facility construction represents more than 100 million square feet annually, valued at approximately $18 billion of completed construction, with renovations and expansions representing a significant percentage. The extraction of raw materials used in the construction of new buildings represents significant natural resource extraction with the potential for ecological disruption, while fossil fuel and chemical emissions associated with materials' processing and product manufacturing and transportation can result in exposures harmful to human health.

In addition, building reuse reduces the amount of solid waste leaving the project site. Construction and demolition debris accounts for more than 30% of municipal solid waste.

Credit Goals

- Use existing structure (including structural floor and roof decking) and envelope (exterior skin and framing, excluding window assemblies and non-structural roofing material) to comprise at least 40% of completed building (including additions).

Documentation

q Calculate the total area of existing exterior envelope (not including windows) and existing building structure to ensure that the credit goals have been met.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Consider reuse of existing buildings, including structure, envelope and interior non-structural elements. Remove elements that pose contamination risk to building occupants and upgrade inefficient components such as windows, mechanical systems and plumbing fixtures.

Use only areas (sf) to calculate the quantity of preserved materials. The area to be used in the denominator is the sum of all (1) floor and roof area, including the ground floor to account for slabs-on-grade and footings, and (2) the exterior wall area, excluding window assemblies. The area to be used in the numerator is the sum of reused floor, roof, and wall area, excluding window assemblies.

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1 point in addition to MR 1.1

MR Credit 1.2

Building Reuse: **Maintain 80% of Existing Walls, Floors and Roof**

Intent

Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to manufacturing and transport of the materials.

Health Issues

Current health care facility construction represents more than 100 million square feet annually, valued at approximately $18 billion of completed construction, with renovations and expansions representing a significant percentage. The extraction of raw materials used in the construction of new buildings represents significant natural resource extraction with the potential for ecological disruption, while fossil fuel and chemical emissions associated with materials' processing and product manufacturing and transportation can result in exposures harmful to human health.

In addition, building reuse reduces the amount of solid waste leaving the project site. Construction and demolition debris accounts for more than 30% of municipal solid waste.

Credit Goals

- Use existing structure and envelope (exterior skin and framing, excluding window assemblies and non-structural roofing material) in an additional 40% (80% total) of existing building structure and shell (exterior skin and framing, excluding window assemblies and non-structural roofing material).

Documentation

q Calculate the total area of envelope skin (not including windows) and existing building structure to ensure that the credit goals have been met.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Consider reuse of existing buildings, including structure, envelope and interior non-structural elements. Remove elements that pose contamination risk to building occupants and upgrade inefficient components such as windows, mechanical systems and plumbing fixtures.

Use only areas (sf) to calculate the quantity of preserved materials. The area to be used in the denominator is the sum of all (1) floor and roof area, including the ground floor to account for slabs-on-grade and footings, and (2) the exterior wall area, excluding window assemblies. The area to be used in the numerator is the sum of reused floor, roof, and wall area, excluding window assemblies.

1 point

MR Credit 1.3

Building Reuse: **Maintain 50% of Interior Non-Structural Elements**

Intent

Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to manufacturing and transport of the materials.

Health Issues

Current health care facility construction represents more than 100 million square feet annually, valued at approximately $18 billion of completed construction, with renovations and expansions representing a significant percentage. The extraction of raw materials used in the construction of new buildings represents significant natural resource extraction with the potential for ecological disruption, while fossil fuel and chemical emissions associated with materials' processing and product manufacturing and transportation can result in exposures harmful to human health.

In addition, building reuse reduces the amount of solid waste leaving the project site. Construction and demolition debris accounts for more than 30% of municipal solid waste.

Credit Goals

- Reuse existing non-shell elements (interior walls, doors, floor coverings, and ceiling systems) in at least 50% of completed building (including additions).

Documentation

q Calculate the total area of exterior skin (not including windows) and existing building structure and related interior non-shell items to ensure that the credit goals have been met.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Consider reuse of existing buildings, including structure, shell and non-shell elements. Remove elements that pose contamination risk to building occupants and upgrade inefficient components such as windows, mechanical systems and plumbing fixtures.

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2 points

MR Credit 2.1 & 2.2

Construction Waste Management: **Divert 50% from Landfill & Incineration**

Intent

Divert construction and demolition debris from disposal in landfills and incinerators. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites.

Health Issues

The US EPA estimates that more than 30% of municipal solid waste is generated by construction and demolition activities. Typical construction projects generate approximately 2.2 pounds of waste per square foot, which equates to over 110 thousand tons of construction waste annually based on current rates of over 100 million square feet of annual average health care construction. A 1998 study by the New York State Department of Health found that women living near solid waste landfills have a four-fold increased chance of bladder cancer or leukemia, based on data from 38 landfills, while a 1989 study by the U.S. EPA found elevated cancers of the bladder, lung, stomach and rectum in counties with the highest concentration of waste sites. Municipal solid waste incinerators emit hydrocarbons, heavy metals, dioxins and furans, acid gases, sulfur dioxide, nitrogen oxides and particulates, exposure to each of which pose risks to human health. Diversion of construction and demolition (C&D) debris through salvaging and recycling extends the life of existing landfills and reduces demand for virgin resources thereby curbing unhealthful air and water emissions resulting from manufacturing with virgin feedstocks and from landfill and incineration operations.

Credit Goals

- Develop and implement a waste management plan in accordance with Triangle J Council of Government's Waste Spec: Waste Specifications for Construction Waste Reduction, Reuse and Recycling, quantifying material diversion goals.
- Define process for surveying and assessing hazardous materials in the existing building, including PCBs, mercury, lead and asbestos. Mercury is a material that may require special remediation attention in the renovation or demolition of an existing health care facility as significant quantities of mercury can accumulate in places such as traps, light fixtures and ceiling and inter-floor spaces from medical equipment breakage over the years, providing an unanticipated significant hazard to construction and demolition crews.
- Quantify materials goals relative to the following diversion methods:
  - Salvaged materials: List materials to be salvaged for reuse in the project in the construction documents. Identify haulers and recipients for salvaged materials and products that will not be reused in the project. List materials that may be economically feasible for salvage.
  - Recycling: Identify haulers and sources for materials recycling. Provide containers for those products that will be sorted either on- or off-site for recycling. Identify reclaimers who recover construction and demolition scrap of their products for recycling. List materials that are eligible for reclamation, including carpets and ceiling tiles.
  - Packaging: Identify manufacturers who reclaim their packaging for reuse or recycling. Identify options for reduced packaging.

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MR Credit 2.1 & 2.2 continued

Construction Waste Management: **Divert 50% from Landfill & Incineration**

- Hazardous materials: Develop procedures for separating hazardous waste by-products of construction (including paints, solvents, oils and lubricants) and for disposing of those wastes according to appropriate federal, state, or local regulations.
  - Prevent loss of soil during construction by stormwater runoff and/or wind erosion, including protecting topsoil by stockpiling for reuse.
  - Prevent sedimentation of storm sewer or receiving streams.
  - Prevent polluting the air with dust and particulate matter.
- Lead Radiation Protection construction components. Pay particular attention to lead in C&D debris, often used as components of Radiation Protection Systems. Separate sheet lead radiation protection and lead lined gypsum board products, lead-lined doors and frames for reuse, salvage or reprocessing. Salvage for reuse or reprocessing all lead-lined glazing products.
- **Credit 2.1 (1 credit)** Recycle and/or salvage at least 50% of construction and demolition debris, not including hazardous waste. Calculations can be done by weight or volume, but must be consistent throughout.
- **Credit 2.2 (1 credit)** Recycle and/or salvage an additional 25% (75% total) of construction and demolition debris. Calculations can be done by weight or volume, but must be consistent throughout.

Documentation

q Compile a Waste Management Plan tabulating the total waste materials, quantities diverted and the means by which diverted. Compare this to calculations of total C&D waste generated by the project.

Reference Standards

Waste Spec: Waste Specifications for Construction Waste Reduction, Reuse and Recycling, Triangle J Council of Governments, July, 1995, www.tjcog.dst.nc.us/cdwaste.htm.

California Integrated Waste Management Board. A Technical Manual of Material Choices in Sustainable Construction, Chapter 9 and Appendix C, July, 2000, http://www.ciwmb.ca.gov.

Potential Technologies & Strategies

Establish goals for landfill diversion and adopt a construction waste management plan to achieve these goals. Consider recycling cardboard, metal, brick, concrete, plastic, clean wood, glass, gypsum wallboard, carpet and insulation. Designate a specific area on the construction site appropriate for either on-site or off-site sorting of materials. Record efforts throughout the construction process. Identify construction haulers and recyclers to handle the designated materials. Depending on project soil conditions, consider using unpainted gypsum board waste as a soil amendment. While not contributing to this credit's diversion percentage, on- or off-site beneficial reuse of land clearing debris is also encouraged. Note that salvage may include donation of materials to charitable organizations such as Habitat for Humanity.

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MR Credit 2.1 & 2.2 continued

Construction Waste Management: **Divert 50% from Landfill & Incineration**

Resources

Recycling and Waste Management During Construction, City of Seattle, www.metrokc.gov/procure/green/wastemgt.htm.

Construction and Demolition Waste Recycling Information, California Integrated Waste Management Board (CIWMB), www.ciwmb.ca.gov/ConDemo/Materials/.

Construction Waste Management Database, US Government Services Administration (GSA), http://www.wbdg.org/ccbref/cwm.php. Free online service for those seeking companies that recycle construction debris in their area.

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1 point

MR Credit 2.3

Construction Practices: **Site & Materials Management**

Intent

Implement site and materials management practices during construction to minimize adverse impacts on adjacent occupants.

Health Issues

Health care construction rarely occurs on undeveloped sites remote from ongoing existing operations. In many instances, construction operations are proximate to existing operational health care facilities, where construction practices have health impacts on adjacent building occupants and building system performance. Careful attention to minimize construction-related health and environmental adverse impacts enhances the high performance building objectives and the health of adjacent occupants.

Credit Goals

- Develop and implement a Construction Practices Environmental Management System (EMS) for the construction and pre-occupancy phases of the building. The below listed "best practices" are strategies the contractor could employ as part of the EMS depending on the size, scope and circumstances of the project.
- Site Utilization:
  - Compile a site access plan to minimize site disruption associated with the project's construction phase. Plan temporary construction facilities, designated staging areas, access roads and construction parking within new building and paving footprints to minimize site disturbance.
  - Establish measures to protect priority sensitive areas of the site, including prohibiting staging, stockpiling and soil compaction. Prevent disturbance to natural resources, protected wetlands and endangered species.
- Temporary Facilities:
  - Utilize salvaged or refurbished materials for construction of temporary facilities, but avoid reuse of pressure treated lumber or lumber with lead paint. Note that while most production of CCA (copper chromium arsenate) pressure treated wood was phased out in the US after Dec. 31, 2003, except for specialty markets such as highways and marine applications, there are no restrictions on continued sale of stockpiled or recycled CCA products after this date. Avoid use of lumber treated with arsenic and chromium.
  - Make all temporary facilities weathertight.
- Delivery, Storage and Handling:
  - Coordinate delivery with scheduled installation date to minimize packaging, handling and storage time at site. Use resource reduction and recycling procedures outlined in ASTM D5834.
  - Store materials in clean, dry location. Protect from soiling, abuse, moisture and microbial growth.
  - Handle and store fuels to prevent spills and discharges into waterways.
  - Store fuels, solvents and other sources of VOCs separately from absorbent materials.
  - Implement practices for proper disposal of waste materials; i.e. concrete truck wash out, tool cleaning, painter clean-up, waste oils from pipe cutting, to prevent discharges into sanitary and stormwater facilities.

MR Credit 2.3 continued

Construction Practices: **Site & Materials Management**

- Construction Site Housekeeping and Particulates Control - Exterior. Establish a constructor's policy and document implementation of the following:
  - Control particulate discharge resulting from sandblasting operations.
  - Use water sprinkling to control dust generation.
- Environmental Manager: Designate an on-site party responsible for overseeing the environmental goals for the project and implementing procedures for environmental protection.
- Environmental Training Program: Provide environmental training for personnel performing work on the project site. Include as a minimum:
  - Overview of environmental issues related to the building industry.
  - Overview of environmental issues related to the Project.
  - Review site specific procedures and management plans, including GGHC SS Prerequisite 1, MR Credits 2.1, 2.2, 2.3, EQ Credits 3.1, 3.2, and 4.6.

Documentation

q Document that a Construction Practices Environmental Management System (EMS) was implemented for the project. Include evidence of compliance with the plan during the construction period.

Reference Standards

Reference Standard: ANSI A10.34-2001, Protection of the Public on or Adjacent to Construction Sites.

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MR Credit 2.3 continued

Construction Practices: **Site & Materials Management**

Potential Technologies & Strategies

Demands are increasing from both private and public owners that contractors provide high-performance, environmentally friendly construction. An Environmental Management System (EMS) serves as a management tool to continually improve all operations that impact the environment including regulatory compliance. It identifies goals and enlists the entire workforce in a coordinated effort to achieve them. A well-implemented plan reaps both short term and long term benefits, which soon pays for itself by:

- Helping a company meet its environmental obligations and avoiding fines for noncompliance.
- Saving costs through process improvements: reducing material inputs, waste disposal costs, reporting costs, and risk of liability.
- Maintaining a company's competitiveness in its markets, and helping to solicit new business from owners specifying high performance, green construction.
- Retaining valuable employees by improving employee morale.
- Boosting public image and relations with regulatory agencies.
- Bringing public recognition by the federal government and some states. An EMS is one of the main criteria for participation in US EPA's National Performance Track Program.

Resources

Environmental Management Systems Guidelines, New South Wales Construction Policy Steering Committee, November 1998. This initiative is aimed at providing a systematic approach to the management of the environmental impacts of the construction industry within the context of the principles of Ecologically Sustainable Development.

US EPA's National Performance Track Program, www.epa.gov/performancetrack.

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1 point

MR Credit 2.4

Construction Practices: **Utility & Emissions Control**

Intent

Reduce air and noise pollution from fossil fueled vehicle and construction equipment use during the construction process. Implement conservation and efficiency practices for temporary utilities.

Health Issues

Health care construction rarely occurs on undeveloped sites remote from ongoing existing operations. In many instances, construction operations are proximate to existing operational health care facilities, where construction practices may have health impacts on adjacent building occupants and building system performance. Managing of construction practices enhances high performance building objectives and minimizes adverse impacts on adjacent occupants.

Construction vehicle emissions and particulate air pollution associated with operation of construction equipment impacts air quality in and around adjacent buildings. Construction vehicles are often operating in areas remote from routine ongoing vehicular operation, which may put them near outdoor air intakes and operable windows. Noise from construction equipment, even within daytime working hours, can be particularly disruptive to therapeutic recovery and healing processes. Currently, the only diesel fuel regulated by EPA is that which is intended for use in highway engines. Specifically, diesel fuel sold for use in most non-road applications such as construction equipment has sulfur on the order of 3,300 parts per million (ppm). In comparison, current standards for fuel used in highway diesel engines limit sulfur concentrations to a maximum of 500 ppm, and the new 2007 rule will drop the cap even lower to 15 ppm in 2006. The sulfur content of diesel fuel is directly related to health risks associated with fuel combustion.

Credit Goals

- Develop and implement a plan to reduce utility, vehicle and other energy-related pollution during the construction phase. Include as a minimum the following:
- Temporary Utilities: Efficiencies and conservation.
  - Temporary lighting & power: Use energy efficient fluorescent and other efficient lighting and controls in lieu of incandescent lighting; control light pollution. Shut off temporary lighting after work hours or 30 minutes after sunset (whichever occurs last) except for stairways and other emergency access and security needs, either by manual or automatic setback means.
  - Temporary water: Meter water usage. Use hoses with trigger nozzles. Control runoff preventing pollutants from entering storm sewer system; prevent ponding and creation of mosquito habitat.
  - Temporary heating & cooling: Use high efficiency equipment. Maintain weathertight enclosures to reduce heat loss.
- Engine use: Efficiencies and conservation.
  - Use alternative fueled vehicles for on-road construction vehicles to provide 50% of the project's vehicular transportation needs (as measured by total mileage logged).
  - Reduce air emissions from construction equipment and other non-road diesel engines by utilizing low-sulfur diesel fuel or biodiesel, or converting to natural gas powered engines.
  - Reduce noise emissions from construction equipment and other non-road engines, by utilizing equipment that meets the Blue Angel Criteria for Low-noise Construction Machinery RAL-UZ 53 as equipment is available that meets or exceeds performance requirements.

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MR Credit 2.4 continued

Construction Practices: **Utility & Emissions Control**

- Use electric powered cranes, compressors and other equipment as appropriate in lieu of combustion engine powered equipment.
- Demonstrate efforts to establish carpooling or alternative transportation program for full time on-site construction personnel.

Documentation

- Document the site carpooling program components, with annual summaries, indicating that the carpooling program has been developed and implemented throughout the entire construction period.
- Document cranes and compressor equipment types for the construction period.
- Document proof of ownership of, or 2 year lease agreement for, alternative fuel vehicles and calculations indicating that alternative fuel vehicles comprise 50% of contractor operated vehicle fleet, in terms of miles driven per year. Document fleet total annual mileage as well as total annual mileage driven by alternative fuel fleet vehicles.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Use alternative fueled on-road construction vehicles, low-sulfur diesel fuel or biodiesel, electric powered cranes, compressors and other equipment and develop carpooling or alternative transportation programs.

Resources

Basic Criteria for the Award of the Environmental Label: Low-noise Construction Machinery RAL-UZ 53, Blue Angel, Sankt Augustin, Germany.

http://www.blauer-engel.de/englisch/produkte_zeichenanwender/vergabegrundlagen/ral.php?id=81

2 points

MR Credit 3

Resource Reuse

Intent

Reuse building materials and products in order to reduce demand for virgin materials and to reduce waste, thereby reducing impacts associated with the extraction and processing of virgin resources.

Health Issues

Resource reuse eliminates primary extraction of virgin resources and manufacturing, thus preventing associated ecosystem disruption, energy expenditure and toxic emissions, while diverting materials from disposal.

Credit Goals

- **Credit 3.1** (1 point) Specify salvaged, refurbished or reused materials, products and furnishings for a minimum of 5% of the total value of all building materials and products used in the project.
- **Credit 3.2** (1 point) Specify salvaged, refurbished or reused materials, products and furnishings for at least another 5% (total 10% or greater) of the total value of all building materials and products used in the project.

Documentation

- Compile calculations listing each material or product used to meet this credit. Include tabulation demonstrating that the project incorporates the required percentage of reused materials and products and showing their costs and the total cost of materials for the project.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Identify opportunities to incorporate salvaged materials into building design and research potential material suppliers. Consider salvaged materials such as beams and posts, flooring, paneling, doors and frames, metal casework, brick and decorative items.

Salvaged materials that are sourced within 300 miles (1000 miles if shipped by rail or water) of the project site may also qualify for the regional materials credits (MR Credit 5.1 and 5.2). However, while reuse of existing buildings may incorporate salvaged materials, salvaged materials cannot be applied to MR Credit 1 (Building Reuse) or MR Credit 4 (Recycled Content).

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2 points

MR Credit 4

Recycled Content

Intent

Increase demand for building products that incorporate recycled content materials, thereby reducing impacts resulting from extraction and processing of virgin materials.

Health Issues

Recycled content materials have the potential to conserve non-renewable resources, lower embodied energy, reduce ecological disruption and air, land and water emissions associated with extracting, transporting, and processing raw materials and manufacturing, and lower global warming potential. As a singular defining element of enhanced environmental performance, recycled content alone may not achieve optimal ecological health benefits as there may be toxic emissions and high energy use associated with reprocessing and manufacturing using recycled-content feedstocks.

Credit Goals

- **Credit 4.1** (1 point) Specify materials with recycled content such that the sum of post-consumer recycled content plus 1/2 the post-industrial recycled content constitutes at least 10% of the total monetary value of the materials in the project.
- **Credit 4.2** (1 point) Use materials with recycled content such that the sum of post-consumer recycled content plus 1/2 the post-industrial recycled content constitutes at least an additional 10% (total 20% or greater) of the total monetary value of the materials in the project.
- Determine the value of the recycled content portion of a material or furnishing by dividing the weight of recycled content in the item by the total weight of all material in the item, then multiplying the resulting percentage by the total value of the item.
- Acceptable recycled-content cements used as substitutes for Portland cement include:
    - Fly ash generated as a coal combustion by-product, only with documentation that the coal plant was not co-fired with hazardous waste, medical waste, or tire-derived fuel and with verified mercury content ≤2ppb (current drinking water standard for mercury).
    - Ground granulated blast furnace slag as a by-product of pig iron production only with documentation that the plant was not co-fired with hazardous waste, medical waste, or tire-derived fuel.
    - Rice husk ash.

Fly ash generated from municipal solid waste incinerators is not an acceptable recycled-content material under this credit.

Mechanical and electrical components are not included in this calculation. Recycled content materials are defined in accordance with the Federal Trade Commission document, Guides for the Use of Environmental Marketing Claims, 16 CFR 260.7 (e).

Documentation

q Compile documentation listing the recycled content products used. Include calculations demonstrating that the project incorporates the required percentage of recycled content materials and products and showing their cost and percentage(s) of post-consumer and/or post-industrial content, and the total cost of all materials for the project.

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MR Credit 4 continued

Recycled Content

Reference Standards

Guides for the Use of Environmental Marketing Claims, 16 CFR 260.7 (e), Federal Trade Commission www.ftc.gov/bcp/grnrule/guides980427.htm.

ASTM E2129-01 Standard Practice for Data Collection for Sustainability Assessment of Building Products.

Potential Technologies & Strategies

Establish a project goal for recycled content materials and identify material suppliers that can contribute to this goal. During construction, ensure that the specified recycled content materials are procured and installed and quantify the total percentage of recycled content materials installed. Third party certification can be useful to assure validity of recycling claims. While mechanical and electrical components are not included in this calculation, specification of products with recycled content is encouraged where available for electrical equipment, such as light fixtures housing, electrical raceways and mechanical products such as air ducts, diffusers and return grilles.

Seek to incorporate products into the building design that not only have recycled content but are also recyclable, reusable or compostable at their end of life in the building.

Given the importance of health issues to these facilities, it is recommended that candidate materials be screened for compliance with the various indoor air quality goals established in EQ Credit 4 as appropriate.

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1 point

MR Credit 5

Regional Materials Extracted and Manufactured Regionally

Intent

Increase demand for building materials and products that are extracted and manufactured within the region, thereby supporting the use of indigenous resources and reducing the environmental impacts resulting from transportation.

Health Issues

The use of regional building materials may avoid local and remote human health impacts that result from transportation activities and the resulting pollution associated with delivery of materials and products to the project site.

Credit Goals

- **Credit 5.1** (1 point):
  - Specify building materials that are extracted, harvested or recovered, then processed and manufactured within a radius of 300 miles for a minimum of 10% of the total value of all building materials and products used in the project.

OR

  - Specify building materials that are extracted, harvested or recovered, then processed and manufactured and shipped primarily by rail or water within a radius of 1,000 miles for a minimum of 10% of the total value of all building materials and products used in the project.

OR

  - Specify a minimum of 10% of building materials that reflects a combination of the above extraction, harvesting, recovering, processing, manufacturing and shipping criteria (e.g., 5% within 300 miles and 5% shipped by rail within 1,000 miles).
- **Credit 5.2** (1 point): Specify an additional 10% (total 20%) of building materials that meet the above criteria.

Documentation

q Prepare calculations demonstrating that the project incorporates the required percentage of regional materials and products and showing their cost, percentage of regional components, transportation service, distance from project to furthest site of extraction or manufacture, and the total cost of all materials for the project.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Establish a project goal for regionally manufactured materials and identify materials and material suppliers that can contribute to achievement of this goal. Create and maintain a database of regional manufacturers. During construction, ensure that the specified regional materials are installed.

Given the importance of health issues to these facilities, it is recommended that candidate materials be screened for compliance with the various indoor air quality goals established in EQ Credit 4 as appropriate.

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1 point

MR Credit 6

Rapidly Renewable Materials: 5%

Intent

Reduce the use and depletion of finite raw materials and long-cycle renewable materials by replacing them with rapidly renewable materials.

Health Issues

Rapidly renewable materials generally yield more material from less acreage, have lower irrigation and pesticide requirements, and do not result in significant biodiversity loss providing they are grown in accordance with sustainable agricultural or forestry practices. These practices prevent pollution of water and land resources and help to maintain healthy ecosystems.

Credit Goals

- Specify rapidly renewable building materials and products primarily made from rapidly renewable resources for a minimum of 5% of the total value of all building materials and products used in the project. Rapidly renewable resources are those materials that substantially replenish themselves faster than traditional extraction demand (i.e., planted and harvested within a ten-year cycle).

Documentation

q Prepare calculations demonstrating that the project incorporates the required percentage of rapidly renewable materials and products. Show their cost and percentage of rapidly renewable components, and the total cost of all materials for the project.

q Obtain documentation from the manufacturer, declaring the rapidly renewable materials contained in the candidate products.

Reference Standards

While recognized certification standards for non-timber forest products and agricultural products used as building materials and products are not yet implemented, both the Forest Stewardship Council and the Smartwood organization have standards in development.

Potential Technologies & Strategies

Establish a project goal for rapidly renewable materials and identify materials and products that can achieve this goal. Consider materials such as bamboo flooring, wool carpet, straw and wheat board, sunflower seed board, cotton batt insulation, linoleum flooring, poplar OSB, and others. Seek materials from producers using low impact sustainable agricultural practices to avoid eutrophication and soil depletion. Watch for emerging sustainable harvest certification systems for rapidly renewable materials.

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1 point

MR Credit 7

Certified Wood

Intent

Encourage environmentally responsible forest management.

Health Issues

Human and environmental health is inextricably linked with forest health. Sustainable forestry protects water quality by reducing water and soil runoff and pesticide and herbicide use. Specifying and procuring certified sustainably harvested wood increases acreage using sustainable management practices. These practices also protect aquatic life, including threatened and endangered species, and maintain viable diverse plant life increasing air filtration and carbon dioxide sequestration. The balancing of carbon dioxide mitigates global climate change, and thereby reduces the spread and redistribution of disease that can be a consequence of climate change.

Credit Goals

- Specify products certified in accordance with the Forest Stewardship Council's Principles and Criteria for a minimum of 50% of the total value of all wood-based materials and products used in the project. This should include all wood building components including, but not limited to, structural framing and general dimensional framing, flooring, finishes, and furnishings.

Documentation

- Prepare a spreadsheet highlighting the FSC-certified materials and products used. Include calculations demonstrating that the project incorporates the required percentage of FSC-certified materials and products and their cost together with the total cost of all materials for the project.
- For each material or product used to meet these goals, document the vendor or manufacturer's Forest Stewardship Council chain-of-custody certificate number.

Reference Standards

ASTM D4840-99 Standard Guide for Sampling Chain-of-Custody Procedures.

Forest Stewardship Council Guidelines www.fscus.org.

Potential Technologies & Strategies

Establish a project goal for FSC-certified wood products and identify suppliers, with an emphasis on regionally supplied products, that can contribute to achieving this goal. Consider also seeking FSC-certified wood for non-rented temporary construction applications such as bracing, concrete form work and pedestrian barriers.

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1 point

MR Credit 8.1

PBT Elimination: **Dioxins**

Intent

Reduce the release of persistent bioaccumulative toxic chemicals (PBTs) associated with the life cycle of building materials.

Health Issues

PBTs are toxic chemicals of particular health concern because they do not break down quickly in the environment, they become widely distributed geographically and they bio-magnify or concentrate in the tissue of living organisms as they move up the food chain. With a few exceptions, the major source of human exposures to PBTs in the general population occurs from the consumption of contaminated food in the ordinary diet. These toxic chemicals cause a range of adverse wildlife and human health effects, including cancer, and developmental impacts in the nervous, reproductive, and immune systems. Immature, developing organisms are the most sensitive to exposures to PBTs.

Because of their toxicity, persistence, and bioaccumulative characteristics, even very small, difficult to detect releases can lead to harmful exposures. This has led to an emphasis on strategies targeting elimination of the production and use of PBT substances, or those that are known to lead to their formation, rather than attempts to control emissions.

Dioxin, addressed in this credit, is an extremely potent carcinogen and reproductive/ developmental toxicant, with adverse impacts at extremely low levels of exposure.

Dioxin is one of at least five of the PBTs commonly addressed in PBT elimination policies that have direct links with building materials. Others include cadmium, mercury, lead, and PCBs (polychlorinated biphenyls). These PBTs are used in the manufacture of building materials or unavoidably produced and released into the environment during one or more stages of the material's life cycle. These credits are aimed at eliminating building materials typically used in construction that either contain one or more PBTs or are associated with PBT releases at one or more stages of their life cycle.

Some building materials are associated with substantial dioxin releases during their lifecycle that are directly related to the product content, hence making product selection a useful strategy for dioxin elimination. For example, the plastics that contain chlorine, such as PVC, and cement from kilns fired with hazardous waste are targeted by this credit because direct dioxin generation is associated with their manufacture as well as with many forms of disposal and accidental combustion of chlorine-containing materials in building fires or landfills. In addition, PVC feedstock production also creates several other target PBTs including PCBs (polychlorinated biphenyls), HCB (hexachlorobenzene), HCBD (hexachlorobutadiene) and octachloro-styrene (OCS). Materials that do not contain chlorine — such as polyolefins and other chlorine-free plastics — are not associated with these types of dioxin releases. It is recognized that any building material can be associated with dioxin releases in their life cycle due to reliance on diesel fuel combustion for transportation and coal combustion to provide power in the manufacturing process. These impacts are not intrinsically related to the material per se, so product selection cannot prevent them.

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MR Credit 8.1 continued

PBT Elimination: **Dioxins**

Other building materials that may have significant direct dioxin releases include aluminum, copper and lead (from smelting (recycling) operations), and iron (from sintering operations). Dioxin releases from copper recycling are dropping dramatically as chlorine sources, particularly PVC wire sheathing, are removed from the recycling stream. Lead is addressed directly in MR Credit 8.3. The others require more analysis to determine whether material avoidance is warranted.

PBT elimination is reflected in policies established by a broad range of local, state, federal and international governmental bodies as well as major health care systems and organizations as reflected in the Resources section below.

Credit Goals

- Specify no use of cement from kilns fired with hazardous waste.

AND

- Specify no use of materials containing virgin or recycled chlorinated compounds including:
    - Chlorinated polyethylene (CPE)
    - Chlorinated polyvinyl chloride (CPVC)
    - Chlorosulfonated polyethylene (CSPE)
    - Neoprene
    - Polyvinyl chloride (PVC)
- In two (2) of the three (3) groups listed below:
- Group 1 - Exterior and Structural:
    - Roof membranes
    - Window and door frames
    - Siding
    - Other exterior finishes
    - Geomembranes
- Group 2 - Interior Finishes:
    - Flooring (minimum of 50% of total floor area)
    - Base
    - Ceiling tiles
    - Wall coverings
    - Window treatments

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MR Credit 8.1 continued

PBT Elimination: **Dioxins**

- Group 3 – Mechanical/Electrical Systems:
  - Piping
  - Conduit and boxes

Exception can be made for minor parts, such as tracks, gaskets, and other seals, as long as a chlorinated compound is not one of the primary materials of the frame or body of the product.

Documentation

q Compile documentation that all products and materials on interior and exterior finish, roof, window and door and piping schedules and concrete specifications meet the goals of this credit. Provide specification language identifying the dioxin reduction goal to the contractor for the aforementioned material categories and indicating that review of material content will be a criterion in all substitution reviews.

Reference Standards

PBT elimination is reflected in policies established by a broad range of local, state, federal and international governmental bodies as well as major health care systems and organizations:

The Stockholm Convention on Persistent Organic Pollutants, signed by EPA Administrator Christine Todd Whitman for the United States with officials from 90 other countries in May 2001, addresses dioxins and furans, PCBs and HCB and commits signatories "to reduce the total releases with the goal of their continuing minimization and, where feasible, ultimate elimination." United Nations Environment Programme on Persistent Organic Chemicals, http://www.chem.unep.ch/pops/ Stockholm Convention on Persistent Organic Pollutants http://www.pops.int/.

United Nations Environmental Program (UNEP) Mandate 22/4 on Mercury calls for national action to reduce or eliminate releases of mercury and its compounds. United Nations Environment Programme Mandate 22/4 on Mercury http://www.chem.unep.ch/mercury/mandate-2003.htm.

The Canada – U.S. International Joint Commission (IJC) study of PBTs in the Great Lakes led to a "Canada -- United States Strategy for the Virtual Elimination of Persistent Toxic Substances in the Great Lakes" signed in April of 1997 by both countries that include dioxins and furans, PCBs, HCB, HCBD, cadmium, lead and mercury. Great Lakes Binational Strategy, http://www.epa.gov/glnpo/p2/bns.html.

The U.S. Environmental Protection Agency (USEPA), in response to the Stockholm Convention, UNEP and IJC, has established a list of target PBTs including dioxins, PCBs, HCB, OCS, lead, and mercury. US EPA Strategy for Priority Persistent, Bioaccumulative and Toxic (PBT) Pollutants http://www.epa.gov/opptintr/pbt/pbtstrat.htm.

US EPA TRI PBT Chemical List, http://www.epa.gov/triinter/chemical/pbt_chem_list.htm.

Washington State's Department of Ecology has established a list of 22 PBTs including dioxins, HCB, HCBD, cadmium, lead, and mercury that the Department has targeted to be virtually eliminated from Washington sources. Washington State PBT Strategy www.ecy.wa.gov/programs/eap/pbt/pbtfaq.html.

The cities of Seattle and San Francisco have both established plans to reduce PBT releases, including eliminating the use of PVC building materials. City of Seattle PBT Reduction Strategy http://www.cityofseattle.net/environment/Documents/PBTStrategy3-07-03.pdf.

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MR Credit 8.1 continued

PBT Elimination: **Dioxins**

A wide range of health care related organizations have passed resolutions directly encouraging action by member organizations to reduce dioxin releases or to reduce or eliminate the use of PVC due to its association with PBTs, including the American Public Health Association, American Nurses Association, California Medical Association, Chicago Medical Society and the Maine Hospital Association. Several major health care systems, including Kaiser Permanente and Catholic Healthcare West are acting to reduce their use of PVC and other PBT related materials from health care products and building materials. American Public Health Association resolution, "Prevention of Dioxin Generation from PVC Plastic Use by Health Care Facilities,"

http://www.apha.org/legislative/policy/policysearch/index.cfm?fuseaction=view&id=125.

Health Care Without Harm listing of resolutions on PVC http://www.noharm.org/pvcDehp/reducingPVC.

Potential Technologies & Strategies

Establish a project goal for materials that meet the dioxin reduction emission goals and identify materials and suppliers to fulfill this goal.

The following list indicates where the specified chlorinated compounds are primarily used in building materials:

- Chlorinated polyethylene (CPE) – geomembranes, wire and cable jacketing
- Chlorinated polyvinyl chloride (CPVC) - water pipes
- Chlorosulfonated polyethylene (CSPE) – roof membranes, electrical connectors and sheet membrane for pond liners
- Neoprene - weather stripping, expansion joint filler, water seals, and other gaskets and adhesives
- Polyvinyl chloride (PVC) – pipes and conduit, waterproofing, siding, roof membranes, door and window frames, resilient flooring, carpet backing, wall covering, signage, window treatments, furniture, wire and cable sheathing
- While exception can be made for minor parts, specifiers are encouraged to seek EPDM and silicone or other non-chlorinated alternative seals and other minor parts where possible.

Consider materials that are not manufactured with chlorine or other halogens. Options include (but are not limited to) TPO, EPDM, and FPO for roof membranes; natural linoleum, rubber, or alternate polymers for flooring and surfacing; natural fibers, polyethylene, polyester and paint for wall covering; polyethylene for wiring; and wood, fiberglass, HDPE, and aluminum with thermal breaks for windows and copper, cast iron, steel, concrete, clay, polypropylene and HDPE for piping.

Substitutions consistent with this credit are also encouraged in furniture and wiring. In wiring substitution, also avoid other halogenated compounds (compounds containing chlorine, bromine or fluorine), most notably the fluoropolymers that have similar health concerns.

Resources

Dioxin formation and waste combustion continues to be studied by EPA and others. For reference, please consult (www.h2e-online.org/) for recent EPA findings on the subject.

Healthy Building Network, PVC Alternatives Database http://www.healthybuilding.net/pvc/alternatives.html.

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1 point **MR Credit 8.2**

PBT Elimination: **Mercury Use in Equipment**

Intent

Reduce the release of persistent bioaccumulative and toxic chemicals (PBTs) associated with the life cycle of building materials.

Health Issues

PBTs are toxic chemicals of particular health concern because they do not break down quickly in the environment, they become widely distributed geographically and they bio-magnify or concentrate in the tissue of living organisms as they move up the food chain. With a few exceptions, the major source of human exposures to PBTs in the general population occurs from the consumption of contaminated food in the ordinary diet. These toxic chemicals cause a range of adverse wildlife and human health effects, including cancer, and developmental impacts in the nervous, reproductive, and immune systems. Immature, developing organisms are the most sensitive to exposures to PBTs.

Because of their toxicity, persistence, and bioaccumulative characteristics, even very small, difficult to detect releases can lead to harmful exposures. This has led to an emphasis on strategies targeting elimination of the production and use of PBT substances, or those that are known to lead to their formation, rather than attempts to control emissions.

Mercury - addressed in this credit - is a potent neurotoxin. Prenatal exposure can result in deficits in language, memory and attention.

Mercury is one of at least five PBTs commonly addressed in PBT elimination policies that have direct links with building materials. Others include cadmium, lead, dioxins (including furans and dioxin like compounds) and PCBs (polychlorinated biphenyls). These PBTs are used in the manufacture of building materials or unavoidably produced and released into the environment during one or more stages of the material's life cycle. These credits are aimed at eliminating building materials typically used in construction that either contain one or more PBTs or are associated with PBT releases at one or more stages of their life cycle.

PBT elimination is reflected in policies established by a broad range of local, state, federal and international governmental bodies as well as major health care systems and organizations as reflected in the Resources section in MR Credit 8.1.

Credit Goals

- Specify HVAC systems, control systems, and other large electrical product and/or systems that are free of mercury switches (tilt, float, pressure and temperature) and mercury relays.
- Categories of equipment screened should include, but not be limited to:
  - HVAC systems
  - Control systems
  - Boiler systems
  - Pump and other fluid control systems

Note: this credit refers to switches and relays built in to equipment. External thermostats and other stand alone switches and control devices are addressed in MR Prerequisite 2.

MR Credit 8.2 continued

PBT Elimination: **Mercury Use in Equipment**

Documentation

- Compile documentation including mechanical schedules noting the mercury-free specifications.
- Prepare specification language identifying the mercury-free goal to the contractor for the aforementioned material categories and indicating that review of material content will be a criterion in all substitution reviews.

Reference Standards

The American Hospital Association (AHA) and the United States Environmental Protection Agency (EPA) signed a Memorandum of Understanding identifying goals to reduce the impact of health care facilities on the environment. A primary goal included the virtual elimination of mercury waste from the health care waste stream by the year 2005. http://www.h2e-online.org/about/mou.htm.

PBT elimination is reflected in policies established by a broad range of local, state, federal and international governmental bodies as well as major health care systems and organizations. Refer to the listing in MR Credit 8.1.

Maine State law (LD 1159) prohibits the sale of mercury in switches, measuring devices (including sphygmomanometers), instruments and thermostats.

See also Reference Standards in MR Prerequisite 2.

Potential Technologies & Strategies

Establish a project goal for mercury-free materials and identify materials and suppliers to fulfill this goal. Consider digital measurement devices and controls.

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1 point

MR Credit 8.3

PBT Elimination: **Lead & Cadmium**

Intent

Reduce the release of persistent bioaccumulative toxic chemicals (PBTs) associated with the life cycle of building materials.

Health Issues

PBTs are toxic chemicals of particular health concern because they do not break down quickly in the environment, they become widely distributed geographically and they bio-magnify or concentrate in the tissue of living organisms as they move up the food chain. With a few exceptions, the major source of human exposures to PBTs in the general population occurs from the consumption of contaminated food in the ordinary diet. These toxic chemicals cause a range of adverse wildlife and human health effects, including cancer, and developmental impacts in the nervous, reproductive, and immune systems.Immature, developing organisms are the most sensitive to exposures to PBTs.

Because of their toxicity, persistence, and bioaccumulative characteristics, even very small, difficult to detect releases can lead to harmful exposures. This has led to an emphasis on strategies targeting elimination of the production and use of PBT substances, or those that are known to lead to their formation, rather than attempts to control emissions.

Lead - addressed in this credit – is a potent neurotoxin, particularly in the developing brain of fetuses and children, and can also cause kidney and reproductive system damage. Cadmium – also addressed here -- is a carcinogen and causes kidney, lung, intestinal, and placental damage.

Lead and cadmium are two of at least five PBTs commonly addressed in PBT elimination policies that have direct links with building materials. Others include mercury, dioxins (including furans and dioxin like compounds) and PCBs (polychlorinated biphenyls). These PBTs are used in the manufacture of building materials or unavoidably produced and released into the environment during one or more stages of the material's life cycle. These credits are aimed at eliminating building materials typically used in construction that either contain one or more PBTs or are associated with PBT releases at one or more stages of their life cycle.

Credit Goals

- Specify substitutes for materials manufactured with lead and cadmium, when cost effective alternatives that meet or exceed performance standards are available, as follows:
  - Specify use of lead-free solder and roofing. Lead is typically found in roofing products in terne, copper roofing, and roof flashing.
  - Specify use of lead-free insulated jacketing of electrical wire and cable that meets or exceeds performance requirements.
  - Specify no use of interior or exterior paints containing cadmium or lead. Green Seal certified or recommended paints meeting Green Seal criteria exclude metals including cadmium, lead, mercury, antimony, and hexavalent chromium.

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MR Credit 8.3 continued

PBT Elimination: **Lead and Cadmium**

Documentation

- q Prepare roofing, electrical wiring and painting schedules noting the lead- and cadmium-free specifications.
- q Prepare specification language identifying the lead- and cadmium-free goal to the contractor for the aforementioned material categories and indicating that review of material content will be a criterion in all substitution reviews.

Reference Standards

Green Seal GS-11 standard http://www.greenseal.org/standards/paints.htm.

Green Seal certified products list, http://www.greenseal.org/certproducts.htm.

Green Seal recommended paints http://www.greenseal.org.

PBT elimination is reflected in policies established by a broad range of local, state, federal and international governmental bodies as well as major health care systems and organizations. Refer to the listing in MR Credit 8.1.

Potential Technologies & Strategies

Establish a project goal for lead- and cadmium-free products and identify products and suppliers to fulfill this goal. Consider products such as silver and other lead-free solder, solderless copper connectors and polyethylene piping, aluminum flashing and Green Seal compliant paints. Note that it is understood that there may be small allowable use of cadmium in equipment beyond the knowledge and access of the designer, such as relay contacts.

Consider lead-free alternate radiation shielding materials.

Note that some PVC products contain lead or cadmium as stabilizers. For example, lead remains the primary stabilizer in PVC insulation for electrical wire and cable, and cadmium and lead are both still found in PVC resilient flooring products. While not all PVC products contain lead or cadmium, specifying PVC-free products as per MR Credit 8.1 (Dioxin) will help ensure greater elimination of potential lead and cadmium sources.

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1 point

MR Credit 9.1

Furniture and Medical Furnishings: **Resource Reuse**

Intent

Reduce the environmental impacts from the manufacture, use and disposal of furniture and medical furnishings products.

Health Issues

Resource reuse eliminates primary extraction of virgin resources, transportation and manufacturing, thus preventing associated ecosystem disruption, energy expenditure and toxic emissions, while diverting materials from disposal.

Credit Goals

- Specify salvaged, refurbished, or used furniture and medical furnishings for a minimum 20% of the total furniture and medical furnishings budget.

Documentation

q Compile a list of furniture and medical furnishings, with the salvaged or reused components identified and indicate their replacement value to determine that the credit goals have been met for the requisite amount of furniture.

Potential Technologies & Strategies

Identify opportunities to salvage and reuse furniture from existing inventory and research potential used furniture suppliers. Consider salvaging and reusing systems furniture and furnishings such as case pieces, seating, filing systems, and medical furnishings such as exam tables, stools, carts, etc.

Furniture dealers are sources for reused furniture and furniture recycling programs at the local and regional levels. This helps save energy and other resources by reducing reshipping impacts and creation of new product using virgin material.

(Note: Hospital beds are excluded from this credit.)

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1 point

MR Credit 9.2

Furniture and Medical Furnishings: **Materials**

Intent

Reduce the environmental impacts from the manufacture, use and disposal of furniture and medical furnishings products.

Health Issues

The environmental and health issues surrounding materials used in the manufacture of furniture products parallel those outlined for building products in the Material and Resource credits. Significant health impacts are associated with the use of Persistent, Bioaccumulative and Toxic Chemicals (PBTs), chrome plated finishes, and wood harvesting for furniture products manufacture.

PBTs are toxic chemicals of particular health concern because they do not break down quickly in the environment, they become widely distributed geographically and they bio-magnify or concentrate in the tissue of living organisms as they move up the food chain. With a few exceptions, the major source of human exposures to PBTs in the general population occurs from the consumption of contaminated food in the ordinary diet. These toxic chemicals cause a range of adverse wildlife and human health effects, including cancer, and developmental impacts in the nervous, reproductive, and immune systems.Immature, developing organisms are the most sensitive to exposures to PBTs.

Because of their toxicity, persistence, and bioaccumulative characteristics, even very small, difficult to detect releases can lead to harmful exposures. This has led to an emphasis on strategies targeting elimination of the production and use of PBT substances, or those that are known to lead to their formation, rather than attempts to control emissions.

Hexavalent chromium is another particularly toxic chemical used in furniture for chrome plating. It poses a wide range of health impacts ranging from respiratory tract damage to cancer, particularly for workers and for residents surrounding manufacturing sites.

The furniture industry is a major market for wood products. Human and environmental health is inextricably linked with forest health. Sustainable forestry protects water quality by reducing water and soil runoff and pesticide and herbicide use. Specifying and procuring certified sustainably harvested wood increases acreage using sustainable management practices. These practices also protect aquatic life, including threatened and endangered species, and maintain viable diverse plant life increasing air filtration and carbon dioxide sequestration. The balancing of carbon dioxide mitigates global climate change, and thereby reduces the potential disease spread predicted to be a consequence of global warming induced climate change.

Credit Goals

- Specify 40% of furniture and medical furnishings by cost that complies with a minimum of two (2) of the following goals:
  - No PBTs in material manufacture - Mercury, Cadmium, Lead or chlorinated compounds (including PVC) in furniture components, textiles, finishes or dyes (per MR Credit 8).
  - No chrome plated finishes.
  - All wood components from FSC Certified Wood (per MR Credit 7).

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MR Credit 9.2 continued

Furniture and Medical Furnishings: **Materials**

Documentation

- Prepare a matrix indicating the three goals and a listing of furniture, indicating that the requisite amount of furniture complies with a minimum of two out of the three listed goals.
- For each material or product used to meet the Certified Wood goal, document the vendor or manufacturer's Forest Stewardship Council chain-of-custody certificate number.

Potential Technologies & Strategies

Heavy metals, such as lead, cadmium, and mercury, can be found in PVC products, fabric dyes and leather tanning. Some manufacturers in the textile industry have eliminated heavy metals from the dyes used in upholstery, backing or barrier cloths, panel fabrics and window textiles. In addition, alternatives exist for PVC-free edging material, furniture connection pieces and panel base covers.

Specify furniture from manufacturers that offer FSC-certified wood products, with an emphasis on regionally supplied products that can contribute to achieving this goal.

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1 point **MR Credit 9.3**

Furniture and Medical Furnishings: **Manufacturing, Transportation and Recycling**

Intent

Reduce the environmental impacts from the manufacture, use and disposal of furniture and medical furnishings products.

Health Issues

The use of regional assembly practices reduces transportation activities and the resulting pollution associated with delivery of furniture products to the project site. Reducing or eliminating packaging, and/or ensuring that the packaging is recyclable or compostable, results in a lessened reliance on disposal. Similarly, the end of life recycling of furniture products reduces solid waste volumes by diverting materials from disposal and reduces the need for continued extraction and raw manufacturing. In both cases, unhealthful air, water, and land pollution associated with landfill and incineration can be reduced.

Credit Goals

Specify 40% of furniture and medical furnishings based on cost that complies with a minimum of two (2) of the following goals:

- Locally and/or regionally assembled – Furniture and medical furnishings that are assembled within 300 miles of the project if transported primarily by truck or 1000 miles if shipped primarily by rail or water.
- Transported with a minimum of packaging - Reduce, reuse, recycle, compost or minimize packaging for shipping, and packaging that is "taken back" by manufacturer for reuse (such as blanket wrapping).
- Has "end of life" destination – is designed for disassembly, recyclablility, biodegradability, or is part of a "take back" program. Furniture that can be disassembled or recycled at end of life, either locally or by the manufacturer through a "take back" program, qualifies.

Documentation

q Prepare a matrix indicating the three goals and a listing of furniture and medical furnishings and their associated costs, indicating that the requisite amount of furniture complies with a minimum of two out of the three listed goals.

Potential Technologies & Strategies

Specify furniture products that are assembled within 300/1000 miles of the project site, depending on mode of transport, to reduce environmental impacts from transportation and support the regional economy.

Minimize packaging and reuse or return packaging to the sender for recycling. Manufacturers are using cardboard with recycled content. Soy inks should be substituted for inks made with heavy metals. Encourage shippers to blanket wrap bulky items, such as chairs, if going directly to the end user. Blankets and pallets are reusable.

A growing number of furniture items are available that can be disassembled to allow for almost 100% recycling done locally and/or by sending back to the manufacturer. A number of manufacturers also have programs to extend product life for reuse by re-manufacturing and recycling programs in furniture systems (see MR Credit 9.1).

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1 point

MR Credit 10

Copper Reduction

Intent

Prevent copper-contaminated stormwater run-off from entering aquatic systems.

Health Issues

Copper is toxic to aquatic species and acutely toxic to plankton and thus can impair the vitality of aquatic ecosystems. Copper enters aquatic systems through direct and indirect sources. In a study of the South San Francisco Bay, 23% of copper was from wastewater treatment plants (the rest was from stormwater sources) and 60 percent of that was estimated to derive from copper pipe corrosion.

Credit Goals

- Eliminate the use of copper metal roofing, copper granule containing asphalt shingles, copper gutters, and copper cladding.

AND

- If using copper pipe requiring the use of solder and flux during installation, specify all solder joints to be compliant with ASTM B828, specify and use ASTM B813 flux to reduce copper pipe corrosion.

Documentation

q Document that the roofing and plumbing schedules and specifications for the project comply with the credit goals.

Reference Standards

ASTM B813-00e1 Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube.

B828-02 Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings.

Palo Alto, CA Municipal Ordinance 16.09.160(b), effective as of January 1, 2003. http://www.city.palo-alto.ca.us/government/municipalcode.html.

Potential Technologies & Strategies

Establish a project goal to eliminate use of exterior copper building products at the project's inception, particularly if the run-off from the building site flows into a sensitive aquatic zone. Identify alternative material options. Reduce copper pipe corrosion through the use of less corrosive fluxes, identified as ASTM B813, offered by most flux manufacturers and by specifying that all solder joints comply with ASTM B828. Using a solderless copper pipe system, such as ProPress, eliminates the need for solder and flux and thereby the source of significant copper corrosion. Alternative pipe materials such as cross-linked polyethylene and cast iron, depending on application, should also be considered as substitutes for copper piping.

Resources

New Palo Alto Ordinance Prohibits Copper Roofing Materials http://www.city.palo-alto.ca.us/cleanbay/pdf/construction/CuRoofOrd.pdf.

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1 point

MR Credit 11.1

Resource Use: **Design for Flexibility**

Intent

Conserve resources associated with the construction and management of buildings by designing for flexibility and ease of future adaptation, and minimizing initial resource use.

Health Issues

Health care facilities undergo substantial renovation and remodeling to accommodate changing technologies and regulatory requirements, thereby generating significant quantities of construction-related wastes, and subjecting building occupants to noise, dust, and other health impacting disruptions associated with construction. By designing flexible, adaptive, generic spaces, buildings can better respond to changes imposed by new equipment and infrastructure requirements with minimum waste and maintain a healthier environment during renovations.

Credit Goals

- Increase building flexibility and ease of adaptive reuse over the life of the structure by employing one (1) or more of the following design and/or space planning strategies such as:
  - modular planning grids
  - use of interstitial spaces
  - development of flexible “technology floors” for diagnostic and treatment facilities to facilitate ease of modifications for changing major equipment.

Documentation

q Compile evidence of strategies employed to improve ease of adaptive reuse of the structure in future renovations, including floor plans, building sections, or modular technology technical data.

Reference Standards

There is no reference standard for this credit.

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MR Credit 11.1 continued

Resource Use: **Design for Flexibility**

Potential Technologies & Strategies

Flexible, adaptable and generic spaces increase building longevity. Strategies for achieving this include:

- Right size the space program, insuring that space assignments are optimized through considering multiple uses for individual spaces, alternative officing (whereby unassigned, flexible workstations are shared by multiple users), and universal sizing (standardized room or workstation sizing).
- Dimensional planning to recognize standard material sizes – wherever possible, design rooms using 2 foot incremental dimensions. An 8 x 11.6' room creates less waste than a 7'-6" x 11'-4" dimension.
- On large-scale projects, consider repetitive design elements. Using redundant dimensions throughout the design of the project facilitates cutting in large batches in a single location.
- Future adaptability, including ample floor-to-floor heights, raised floor distribution systems or interstitial space to allow for ease of future modifications, implementation of undifferentiated "technology floors" to accommodate surgical, cardiology and radiological procedures in equally sized and adaptable planning modules.
- Ease of installation and deconstruction, including modular, demountable building systems that can be relocated, reused, or salvaged in the future. Detailing for easy disassembly by using screws and bolts in place of nails and adhesives will reduce future renovation costs.
- Employ design strategies to reduce the use of materials, such as exposed ceilings, concrete floors, and exposed structural framework.

Resources

New York City High Performance Building Guidelines, Dept of Design and Construction, 1999, http://www.nyc.gov/html/ddc/html/ddcgreen/.

Designing With Vision: A Technical Manual for Material Choices in Sustainable Construction, Chapter 8, California Integrated Waste Management Board, July, 2000, http://www.ciwmb.ca.gov/ConDemo/Pubs.htm.

1 point

MR Credit 11.2

Resource Use: **Minimize Materials**

Intent

Conserve resources associated with the construction and management of buildings by designing for flexibility and ease of future adaptation, and minimizing initial resource use.

Health Issues

Health care facilities undergo substantial renovation and remodeling to accommodate changing technologies and regulatory requirements, thereby generating significant quantities of construction-related wastes, and subjecting building occupants to noise, dust, and other health impacting disruptions associated with construction. By designing flexible, adaptive, generic spaces, buildings can better respond to changes imposed by new equipment and infrastructure requirements with minimum waste and maintaining a healthier environment during renovations.

Credit Goals

Minimize raw material usage of the structure over its life cycle by one or both of the following:

- Demountable and modular building systems or components for partitions, raised floor distribution systems, or the like, comprising a minimum of 5% of the total value of the building component. In the case of modular casework, such casework must comprise 50% of the total combined value of casework and custom millwork.

OR

- Demonstrate construction systems and/or strategies that require less material by utilizing shell elements as finish materials where appropriate (such as exposed ceilings, polished concrete floors, or expressed structure), that reduce total material usage by 5% (not including reuse of existing structure or shell as enumerated in MR Credit 1). Only habitable areas of the building that utilize shell elements as finish materials may be used to fulfill this goal.

Documentation

q Prepare calculations indicating that construction systems or strategies comply with the goals.

Potential Technologies & Strategies

Flexible, adaptable and generic spaces increase building longevity. Strategies for achieving this include:

- Ease of installation and deconstruction, including modular, demountable building systems that can be relocated, reused, or salvaged.
- Detail for easy disassembly by using screws and bolts in place of nails and adhesives.

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MR Credit 11.2 continued

Resource Use: **Minimize Materials**

Employ design strategies to reduce the single use of built-in casework. Consider modular casework for ease of installation, deconstruction and reuse at all areas that use standard or basic casework. Employ design strategies to reduce "single use" aspects of reception desks, nursing stations, and the like, whether through use of furniture or through demountable design strategies.

Employ design strategies to reduce the use of materials, such as exposed ceilings, concrete floors, and exposed structural framework.

Resources

New York City High Performance Building Guidelines, Dept of Design and Construction, 1999, http://www.nyc.gov/html/ddc/html/ddcgreen/.

Designing With Vision: A Technical Manual for Material Choices in Sustainable Construction, Chapter 8, California Integrated Waste Management Board, July, 2000, http://www.ciwmb.ca.gov/ConDemo/Pubs.htm.

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Environmental Quality

Required

EQ Prerequisite 1

Minimum IAQ Performance

Intent

Establish minimum indoor air quality (IAQ) performance to prevent the development of indoor air quality problems in buildings, thus contributing to the comfort and well-being of the occupants.

Health Issues

The EPA estimates that indoor air pollution is one of the top five environmental risks to public health and as much as 10 times more polluted than outside air. Indoor air pollutants can cause problems ranging from immediate acute effects such as eye, nose, and throat irritation; sinusitis, asthma attacks, headaches; loss of coordination; and nausea; to long range chronic damage to the lungs, liver, kidney, and central nervous system and cancer. Building materials and the products used to install, clean and maintain them can be significant sources of a wide range of VOCs and other indoor air pollutants. Coupling properly designed, operated and maintained mechanical equipment with low-emitting materials can ensure healthy indoor air.

Credit Goals

- Meet the minimum requirements of voluntary consensus standard ASHRAE 62-2001, Ventilation for Acceptable Indoor Air Quality, and Addenda approved at the time the building was permitted. Mechanical systems shall be designed using the Ventilation Rate Procedure.

Documentation

q Prepare calculations demonstrating that the project is fully compliant with ASHRAE 62-2001 and all published Addenda and describing the procedure employed in the IAQ analysis (Ventilation Rate Procedure).

Reference Standards

ASHRAE 62-2001 Ventilation for Acceptable Indoor Air Quality www.ashrae.org and Standard 62 Addenda page at http://www.ashrae.org/template/AssetDetail/assetid/30205.

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EQ Prerequisite 1 continued

Minimum IAQ Performance

Potential Technologies & Strategies

Establishing strategies for good indoor air quality at the outset of project development is more effective and achievable than addressing air quality as an issue during construction or building operation. These strategies can be categorized by type and prioritized as follows:

- Ventilation (refer to EQ Credit 2). Develop ventilation strategies that support operable windows, where appropriate. Design for mechanical ventilation air change rates required by health code standards, zoning areas where contaminants are generated.
- Construction Methods (refer to EQ Credit 3). Control indoor air quality during construction and mitigate impacts on occupied building air quality. Flush newly constructed or renovated buildings with 100% outside air prior to occupancy.
- Building Materials (refer to EQ Credits 4 & 8). Significant sources of indoor air pollution are materials and products used in the building, such as adhesives, paints, carpeting, upholstery, manufactured wood products and other components of furniture, including medical furniture & equipment, each of which may emit volatile organic compounds (VOCs), including formaldehyde.
- Source Control (refer to EQ Credit 5 and Operations). Sources can include outdoor pollutants, indoor chemical use (including glutaraldehyde and other sterilizing agents and methylene chloride, used in adhesive removers, paint stripper, and aerosol spray paints), cleaning products, fragrances and pest control activities.,
- Building Maintenance and Operation (refer to EQ Credit 5 and Operations).
- Control systems. Install sensors for relative humidity, temperature, and carbon dioxide. Consider occupant control systems to improve individual comfort.

Resources

High Performance Building Guidelines, New York City DDC, 1999.

I-Beam: The Future of IAQ in Buildings, United States Environmental Protection Agency; EPA 402-C-01-001, December 2002, IAQ Building Education and Assessment Model (I-Beam), www.epa.gov/iaq/largebldgs.

Guidelines for Environmental Infection Control in Health-Care Facilities: Recommendations of CDC and the Health Care Infection Control Practices Advisory Committee (HICPAC), U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, Morbidity and Mortality Weekly Report, Recommendations and Reports June 6, 2003 / Vol. 52 / No. RR-10, http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5210a1.htm.

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Required **EQ Prerequisite 2**

Asbestos Removal or Encapsulation

Intent

Reduce the potential exposure of building occupants to asbestos and avoid associated harmful effects of asbestos in existing buildings.

Health Issues

Asbestos exposure is linked to documented health impacts, most notably mesothelioma (a specific kind of cancer of the lung, chest or and abdominal lining) and asbestosis, a chronic form of lung disease. To minimize exposure of building occupants, regulatory authorities require remediation of asbestos containing building materials, either through a process of encapsulation or removal. Asbestos abatement undertaken during renovation while building is partially occupied should take especial precautions to ensure 100% containment of asbestos fibers.

Credit Goals

- Comply with US EPA's asbestos removal, encapsulation and management regulations, NESHAP 40 CFR 61, for asbestos containing material in buildings. Remove any potentially friable asbestos materials that are located in ventilation distribution plenums or chases in accordance with OSHA 29 CFR Part 1926.
- Identify all asbestos containing materials that may be affected by proposed construction activities through a comprehensive audit process. Comply with all authorities having jurisdiction concerning removal and/or encapsulation requirements for each asbestos containing material. Pay attention to means and methods of containment, air quality monitoring during abatement procedures, disposition of debris and disposal of materials.

Documentation

- ☐ Prepare a comprehensive audit of all asbestos located in the existing facility that may be affected by the proposed construction.
- ☐ Obtain documentation certifying that any asbestos-containing materials located in areas affected by proposed construction activities have been removed or encapsulated in accordance with OSHA 29 CFR Part 1926. Obtain certification from an independent testing authority stating that asbestos containing materials are not present in the building or on the site affected by proposed construction activities prior to the start of construction.

Reference Standards

US EPA National Emission Standards for Hazardous Air Pollutants (NESHAP) 40 CFR 61.

Potential Technologies & Strategies

Engage an environmental testing agency and licensed asbestos abatement professional to audit building systems and materials and determine protocols and procedures to encapsulate or remove asbestos containing materials as appropriate.

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1 point

EQ Credit 1

Air Quality Monitoring

Intent

Provide capacity for indoor air quality (IAQ) monitoring to help sustain long-term occupant comfort and well-being.

Health Issues

Elevated CO2 levels can indicate diminished indoor air quality. By maintaining low CO2 levels, building occupants experience improved indoor air quality, resulting in improved health and productivity. This is particularly important in hospitals, where patients with impaired immune, respiratory, and neurological systems are especially vulnerable to poor indoor environmental conditions. Children, pregnant women, the elderly, and those with allergies, asthma or chemical sensitivities are also at increased risk of suffering adverse health effects from compromised indoor air quality.

Credit Goals

For mechanical ventilation systems that predominantly serve densely occupied spaces (spaces with a design occupant density greater than or equal to 25 people per 1000 sf (40 sf/ person) provide the following:

- Provide a CO2 sensor or sampling location for each densely occupied space and compare with outdoor ambient CO2 concentrations.
- Install CO2 sensors certified by the manufacturer to have an accuracy of no less than 75 ppm, factory calibrated or calibrated at start-up, and certified by the manufacturer to require calibration no more frequently than once every 5 years.
- Monitor CO2 sensors by a control system capable of and configured to trend CO2 concentrations on no more that 15 minute intervals for a period of no less than 6 months.
- Configure the control system to be capable to generate an alarm visible to the system operator if the CO2 concentration in any zone rises more than 15% above that corresponding to the minimum outdoor air rate required by ASHRAE Standard 62.
- CO2 sensors may be used for demand controlled ventilation provided the control strategy complies with Standard 62 (see IEQ Prerequisite 1), including maintaining the area-based component of the design ventilation rate.

For all other mechanical ventilation systems, provide the following:

- An outdoor airflow measurement device capable of measuring (and, if necessary, controlling) the minimum outdoor airflow rate at all expected system operating conditions within 15% of the design minimum outdoor air rate.
- The outdoor airflow measurement device shall be monitored by a control system capable of and configured to trend outdoor airflow on no more that 15 minute intervals for a period of no less than 6 months.
- The control system shall be capable and configured to generate an alarm visible to the system operator if the minimum outdoor air rate falls more than 15% below the design minimum rate.

Documentation

- **q** Provide summary of the installation, operational design and controls and zones for the air quality monitoring system. For mixed use buildings, calculate dilution rates and allowable carbon dioxide levels for each separate activity level and use.

Reference Standards

ASHRAE Standard 62-2001, Appendix C & D.

ASHRAE Standard 55-1992, Table 4.

Potential Technologies & Strategies

Design the HVAC system with carbon dioxide monitoring sensors in locations with anticipated high occupancy densities and/or long duct runs or those locations that are challenging to provide adequate ventilation. Consider integrating these sensors with the building automation system (BAS).

1 point

EQ Credit 2

Increase Ventilation Effectiveness

Intent

Provide for the effective delivery and mixing of fresh air to support the safety, comfort and well-being of building occupants.

Health Issues

Providing appropriate ventilation levels is one element of achieving healthy indoor air quality. Proper ventilation rates can be linked to enhanced worker productivity, comfort and reduced absenteeism. These benefits may lead to lower health care and insurance costs. This is particularly important in hospitals, where patients with impaired immune, respiratory, and neurological systems are especially vulnerable to poor indoor environmental conditions. Children, pregnant women, the elderly, and those with allergies, asthma or chemical sensitivities are also at increased risk of suffering adverse health effects from compromised indoor environmental quality.

Credit Goals

- For mechanically ventilated buildings, develop ventilation systems that result in an air change effectiveness (Eac) greater than or equal to 0.9 as determined by ASHRAE 129-1997. For naturally ventilated spaces demonstrate a distribution and laminar flow pattern that involves not less than 90% of the room or zone area in the direction of air flow for at least 95% of hours of occupancy.
- Areas not totaling in excess of 25% of total building area may be excluded where a) air distribution design is mandated and/or restricted by code (such as operating suites, negative pressure rooms, burn rooms, soiled utility rooms and some other critical care rooms) or for b) unoccupied spaces (such as storage and mechanicals areas) or c) spaces with no supply distribution.

Documentation

- ☐ For mechanically ventilated spaces, provide calculations demonstrating that the design achieves air change effectiveness (Eac) of 0.9 or greater in each ventilated zone. Complete the table summarizing the air change effectiveness achieved for each zone.

OR

- ☐ For mechanically ventilated spaces, compile evidence that the design complies with the recommended design approaches in ASHRAE 2001 Fundamentals Chapter 32, Space Air Diffusion.

OR

- ☐ For naturally ventilated spaces, compile evidence that the design provides effective ventilation in at least 90% of each room or zone area in the direction of airflow for at least 95% of the hours of occupancy. Include a table summarizing the airflow simulation results for each zone. Include sketches indicating the airflow pattern for each zone.

Reference Standards

ASHRAE Standard 129-1997.

EQ Credit 2 continued

Increase Ventilation Effectiveness

Potential Technologies & Strategies

Design the HVAC system and building envelope to optimize air change effectiveness. Air change effectiveness can be optimized using a variety of ventilation strategies including displacement ventilation, low-velocity ventilation, plug-flow ventilation such as under floor or near floor delivery, and operable windows. Test the air change effectiveness of the building after construction.

NOTE: EQ Credits 1 & 2 are undergoing substantial review by the USGBC for LEED- NC v2.2 with a redirected focus on outdoor air quantities. We are tracking this process and will consider revision of these credits when the LEED process is complete.

1 point

EQ Credit 3.1

Construction IAQ Management Plan: **During Construction**

Intent

Prevent indoor air quality problems resulting from the construction or renovation process to sustain the comfort and well-being of construction workers and building occupants.

Health Issues

Protecting indoor air quality is an imperative for health care facilities. Patients with suppressed immune systems and other underlying chronic diseases or conditions and staff responsible for performing critical tasks require healthy air. The most common site of injury associated with airborne pollutants is the lung; acute effects may also include non-respiratory signs and symptoms, depending on the specific toxicity of the pollutants. Health impacts associated with construction practices in health care settings are regulated through Infection Control Risk Assessment (ICRA) policies and procedures in those states that adopt the *AIA Guidelines for Construction of Health Care Facilities (*2001 edition), or most recent update. The Infection Control Risk Assessment, and the Guidelines themselves, mandate development of construction procedures and practices to minimize impacts of construction activities on the health of building occupants in adjacent occupied areas. This credit builds upon the foundation of ICRA procedures to include aspects of sustainable construction practices that go beyond the current provisions of the Guidelines or ICRA.

Credit Goals

Develop and implement an Indoor Air Quality (IAQ) Management Plan for the construction and pre-occupancy phases of the building as follows:

- Manage the site in conjunction with the Infection Control Risk Assessment (ICRA) procedures outlined by the Owner and Designer as defined by Joint Commission on Accreditation of Health Care Organizations (JCAHO) Environment of Care Standard (EC.3.2.1).
- Containment/isolation: In occupied buildings, seal the construction site with deck-to-deck partitions and maintain the construction area under negative pressure throughout the entire construction process. Contain and exhaust odors produced by indoor construction processes (e.g. painting, epoxy flooring, adhesive and coating applications) to insure that they do not migrate in to occupied areas.
- If air handlers must be used during construction, filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 must be used at each return air grill, as determined by ASHRAE 52.2-1999.
- Replace all filtration media immediately prior to occupancy.
- During construction meet or exceed the recommended Design Approaches of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guideline for Occupied Buildings Under Construction, 1995, Chapter 3 and 4.
- Mold & mildew: Prepare a written program to guide actions to prevent mold and mildew growth. Protect absorptive materials from moisture damage while they are stored on-site and after they are installed. Immediately remove from site and properly dispose of any materials with stains, mold, mildew or other evidence of water damage and replace with new, undamaged materials.

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EQ Credit 3.1 continued

Construction IAQ Management Plan: **During Construction**

- VOC absorption: Schedule construction procedures to minimize exposure of absorbent materials to VOC emissions. For example, complete "wet" construction procedures such as painting and sealing before storing or installing "dry" absorbent materials such as carpet or ceiling tiles. These absorptive materials act as a "sink", retaining contaminants and releasing them over time. Store fuels, solvents and other sources of VOCs separately from absorbent materials.
- For painting equipment, develop a plan requiring use of high-volume, low-pressure (HVLP) paint guns and implement the plan when painting equipment is used.
- Maximize use of no or low-VOC emitting construction materials (see EQ Credit 4).
- Pests: Use integrated pest management (IPM) practices (see EQ Credit 5.4 Integrated Pest Management).
- Dust control: use dustless sanding techniques with tools equipped to collect dust. Utilize non-toxic, dustless housekeeping protocols. Comply with GS 37 for cleaning products (see EQ Credit 5.3). Seal ducts during transportation, delivery, and construction to prevent accumulation of construction dust and construction debris inside ducts.
- Environmental Tobacco Smoke Control: Prevent exposure of building occupants, workers and systems to Environmental Tobacco Smoke. Designate "smoking areas" on the construction site. Locate exterior designated smoking areas at least 25 feet away from entries, outdoor air intakes and operable windows.
- Noise Control: Coordinate equipment locations and timing or sequencing of work operations to minimize particularly disruptive, high decibel operations or equipment noise from disturbance of building occupants and workers. Prohibit radios, boom boxes and other noise making equipment in areas where sound may disturb adjoining space occupants.

Documentation

- q Compile, implement and maintain a written Construction IAQ Management Plan highlighting the SMACNA requirements.
- q Compile technical data on filtration media, listing each air filter used during construction and at the end of construction. Include the MERV value, manufacturer name and model number.
- q Maintain a copy of the ICRA developed for the project, highlighting these and any additional measures used to minimize the impact of construction on adjacent areas.
- q Prepare specifications requiring use of high-volume, low-pressure (HVLP) paint guns and certification by an authorized party that plan was implemented, as applicable.
- q Document the design approaches of SMACNA IAQ Guideline for Occupied Buildings Under Construction, Chapter 3, which were used during building construction. Include a brief description of some of the important design approaches employed.
- q Document the management approaches of SMACNA IAQ Guidelines for Occupied Buildings Under Construction, Chapter 4, which were used during building construction.

EQ Credit 3.1 continued

Construction IAQ Management Plan: **During Construction**

Reference Standards

Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guideline for Occupied Buildings Under Construction, 1995.

Duct Cleanliness for New Construction Guidelines, 2000.

NIOSH Publication No. 99-113: Control of Drywall Sanding Dust Exposures.

Potential Technologies & Strategies

Adopt an IAQ Management Plan to protect the HVAC system during construction, control pollutant sources and interrupt contamination pathways. Sequence the installation of materials to avoid contamination of absorptive materials such as insulation, carpeting, ceiling tile and gypsum wall board. Coordinate with Indoor Environmental Quality Credits 3.2 and 5.2 and install only a single set of final filtration media.

Containment-Area Ventilation and Exhaust:

- Do not use building air handling systems serving area of containment for ventilation or exhaust during odor causing processes. Units serving adjacent areas may remain in operation provided they are fully isolated from odor causing areas.
- In renovation areas, keep units that serve occupied areas outside of the construction area in service. On systems to remain in service, seal ductwork openings into the construction area to isolate them from occupied areas. Adjust fan systems or provide temporary relief for excess air from openings sealed. Ensure existing facilities and systems are not adversely impacted by temporary HVAC procedures.
- Provide temporary ventilation and exhaust to areas of containment, separate from building systems.
- Prepare temporary ventilation and exhaust systems to maintain a negative pressure relationship in the construction area relative to the adjacent space. Provide a minimum ventilation of six air changes per hour.

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1 point

EQ Credit 3.2

Construction IAQ Management Plan: **Before Occupancy**

Intent

Reduce indoor air quality problems resulting from the construction or renovation process to sustain the comfort and well-being of construction workers and building occupants.

Health Issues

The indoor air quality impacts of recently installed construction materials are well documented. Many wet products, such as paints, adhesives, varnishes, and sealants, off-gas considerable levels of volatile organic compounds (VOCs) for months after application, but particularly in the 7 – 14 day period following their initial installation. These may result in a variety of health effects in patients and health care workers, including headaches and respiratory symptoms. Many of the products of particular concern are finish materials, which are on the site late in the construction process, shortly before intended occupancy dates. The American Society of Health Care Engineering recommends SMACNA-based IAQ procedures.

Credit Goals

Develop and implement an Indoor Air Quality (IAQ) Management Plan for the pre-occupancy phase of the building as follows:

- After construction ends and prior to occupancy conduct a minimum two week building flush-out with new filtration media at 100% outside air. After the flushout, replace the filtration media with new filtration media, except for the filters solely processing outside air.

OR

- After construction ends and prior to occupancy conduct a baseline indoor air quality testing procedure that demonstrates that the concentration levels for the chemical contaminants listed below are not exceeded. For each sampling point where the maximum concentration limits are exceeded conduct a partial building flush-out, for a minimum of two weeks, then retest the specific parameter(s) that were exceeded to indicate the goals are achieved. Repeat procedure until all goals have been met.

Chemical Contaminate	Maximum Concentration
Carbon Dioxide (CO2) *	8,300 x MET Rate / Ventilation Rate
Formaldehyde	0.05 parts per million
Particulates (PM10)	20 micrograms per cubic meter above outside air conditions
Total Volatile Organic Compounds (TVOC)	500 micrograms per cubic meter
4-Phenylcyclohexene (4-PCH)	3 micrograms per cubic meter (only required if carpet or fabric installed with SB latex backing)
Carbon Monoxide (CO)	9 part per million and no greater than 2 parts per million above outdoor

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EQ Credit 3.2 continued

Construction IAQ Management Plan: **Before Occupancy**

CO_2 measurements are only required if the building is regularly occupied during the testing. The ventilation rate is the outdoor air requirement per person, and the CO_2 measurement is the differential between indoor and outdoor conditions based on occupancy type as defined by ASHRAE 62-2001. The MET Rate is as defined in ASHRAE 55.

- The air sample testing shall be conducted as follows:
  - Air samples collected for every 25,000 square feet, or for each contiguous floor area, whichever is greater.
  - Measurements to be conducted with the building ventilation system starting at normal daily start time and operated at the minimum outside air flow rate for the occupied mode throughout duration of the air testing.
  - Building shall be fully finished and unoccupied. Furniture can be included in the testing if desired but it is not required.
  - Test with time weight values of 4 hours with data logging.
  - When retesting non-complying building areas, take samples from the same locations as in first test.

Documentation

q Document the building flush-out procedures, including actual dates for building flush out.

OR

q Document that the referenced standard's IAQ testing protocol has been followed. Include a copy of the testing results.

AND

q Prepare the ICRA for the project, highlighting these and any additional measures used to minimize the impact of construction on adjacent areas.

Reference Standards

Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guideline for Occupied Buildings Under Construction, 1995.

Duct Cleanliness for New Construction Guidelines, 2000.

Potential Technologies & Strategies

Specification of low-emitting materials as per Environmental Quality Credit 4 will improve potential for early passage of baseline testing. Coordinate with Environmental Quality Credits 3.1 and 5.1 and install only a single set of final filtration media. For IAQ testing consider using a recognized measurement protocol such as the EPA "Compendium of Methods for the Determination of Air Pollutants in Indoor Air." Copies of the IAQ testing results should describe the contaminant sampling and analytical methods, the locations and duration of contaminant samples, the field sampling log sheets and laboratory analytical data and the methods and results utilized to determine that the ventilation system was started at the normal daily start time and operated at the minimum outside air flow rate for the occupied mode through the duration of the air testing.

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1 point

EQ Credit 4.1

Low-Emitting Materials: **Interior Adhesives & Sealants**

Intent

Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.

Health Issues

Volatile organic compound emissions (VOCs) from adhesives and sealants contribute to lowering indoor and outdoor air quality and negatively affecting human health. These VOCs and the carcinogens and reproductive toxicants addressed by this credit represent a serious health risk to both the installers and the building occupants. The at-risk populations in a health care system with impaired immune, respiratory, and neurological systems are particularly vulnerable to poor indoor environmental conditions. Children, pregnant women, the elderly, and those with allergies, asthma or chemical sensitivities are also at increased risk of suffering adverse health effects from poor indoor environmental quality.

Credit Goals

- Use only adhesives and sealants with volatile organic compound (VOC) content that does not exceed the lower of the current VOC content limits of:
  - South Coast Air Quality Management District (SCAQMD) Rule #1168

AND

  - Bay Area Air Quality Management District (BAQMD) Regulation 8, Rule 51

EXCEPT FOR

  - flat sealants which must not exceed 50 grams/liter (SCAQMD 2008 level)

AND

  - aerosol adhesives which must meet Green Seal Standard GC-36 requirements

Note that the California Air Quality Management District rules reduce allowable limits over time. SCAQMD has the lowest limits as of this writing but that is subject to change. Consult the links below to assure you are using the current limits.

- Use only adhesives and sealants with no carcinogen or reproductive toxicant components present at more than 1% of total mass of the product as defined in the following lists:
  - CA OEHHA, Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65).
  - CA Air Resources Board (ARB), list of Toxic Air Contaminants (California Air Toxics).

Documentation

q Compile a list of adhesives and sealants used in the building and manufacturer verification that they meet the noted goals.

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EQ Credit 4.1 continued

Low-Emitting Materials: **Interior Adhesives & Sealants**

Reference Standards

Bay Area Air Quality Management District Regulation 8, Rule 51 & Rule 3, http://www.baaqmd.gov/dst/regulations/index.asp.

CA Air Resources Board (ARB), list of Toxic Air Contaminants (California Air Toxics), http://www.arb.ca.gov/toxics/summary/summary.htm.

Green Seal Commercial Adhesives (GS-36) http://www.greenseal.org/standards/commercialadhesives.htm.

CA OEHHA, Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65), http://www.oehha.ca.gov/prop65/prop65_list/Newlist.html.

South Coast Air Quality Management District (SCAQMD) Rule #1113, http://www.aqmd.gov/rules/reg/reg11/r1113.pdf.

South Coast Air Quality Management District (SCAQMD) Rule #1168, http://www.aqmd.gov/rules/reg/reg11/r1168.pdf.

Potential Technologies & Strategies

Specify low-VOC and non carcinogenic, non toxic materials in construction documents, including furniture and equipment specifications. Ensure that VOC and carcinogen/toxicant component limits are clearly stated in each section where adhesives and sealants are addressed.

VOC content has serious limitations as a predictor of emissions. Emissions testing protocols are beginning to evolve to evaluate building materials and products. Ask distributors for products with actual emission testing from protocols such as CA 1350 or GreenGuard. This standard will evolve in that direction as more tested products enter the marketplace.

1 point

EQ Credit 4.2

Low-Emitting Materials: **Wall & Ceiling Finishes**

Intent

Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.

Health Issues

Volatile organic compound emissions (VOCs) from paints wall coverings, acoustical wall treatments, wood paneling systems, ceiling tiles contribute to lowering indoor and outdoor air quality and negatively affecting human health. VOCs, carcinogens and reproductive toxicants represent a serious health risk to both the installers and the building occupants. The at-risk populations in a health care system with impaired immune, respiratory, and neurological systems are particularly vulnerable to poor indoor environmental conditions. Children, pregnant women, the elderly, and those with allergies, asthma or chemical sensitivities are also at increased risk of suffering adverse health effects from poor indoor environmental quality.

Credit Goals

- Paints and coating used on the interior of the building and applied on-site must not exceed the VOC limits and must not include any of the chemical components limited or restricted by the most current version (unless otherwise noted) of the following standards:
  - Topcoat Paints: Green Seal Standard GS-11, Paints.
  - Anti-Corrosive & Anti-Rust Paints: Green Seal Standard GS-03, Anti-Corrosive Paints, for applications on ferrous metal substrates.
  - All other Architectural Coatings, Primers and Undercoats: South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, rules in effect for 1/1/2008.
  - Bay Area Air Quality Management (BAQMD) District Regulation 8, Rule 3.
- When ceiling tiles and or wall coverings are used instead of paint, use only products that:
  - Meet or exceed the indoor air quality requirements of California's Special Environmental Requirements, Specifications Section 01350, updated with California DHS Standard Practice CA/DHS/EHLB/R-174 and using the standard office building protocol parameters.

  OR

  - Are certified by GreenGuard.

Documentation

q Compile a list of paints and coatings used in the building and identify manufacturer documentation declaring that they comply with the current VOC and chemical component limits of the credit goals. Listing on the Green Seal Certified Products List or the CHPS Low-Emitting Materials Compliant Materials Table is sufficient.

q Compile documentation indicating that wall covering and ceiling tile products have been tested for compliance with the credit goals. Some tested wall covering and tile products are listed in the CHPS Low-Emitting Materials Compliant Materials Table.

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EQ Credit 4.2 continued

Low-Emitting Materials: Wall & Ceiling Finishes

Reference Standards

Green Seal Paint Standard GS-11 & GS-03, http://www.greenseal.org/standards/paints.htm.

Green Seal Certified Products List, www.greenseal.org/certproducts.htm#paints.

South Coast Air Quality Management District (SCAQMD) Rule 1113, http://www.aqmd.gov/rules/reg/reg11/r1113.pdf.

Bay Area Air Quality Management District Regulation 8, Rule 3, www.baaqmd.gov/dst/regulations/index.asp.

Collaborative for High Performance Schools (CHPS), Section 01350 Special Environmental Requirements, www.chps.net/manual/documents/Sec_01350.doc.

DHS Standard Practice CA/DHS/EHLB/R-174, www.dhs.ca.gov/ps/deodc/ehlb/iaq/VOCS/Practice.htm.

CHPS Low-Emitting Materials Compliant Materials Table, www.chps.net/manual/lem_table.htm.

GreenGuard, www.greenguard.org.

Potential Technologies & Strategies

Specify low- and no-VOC paints and coatings in construction documents, including furniture and equipment specifications. Ensure that Green Seal's Standard GS-11 VOC and other chemical limits are clearly stated in each section where paints and coatings are addressed.

GreenSeal Class A paints are lowest toxic content with no VOCs. Use Class A wherever possible.

VOC content has serious limitations as a predictor of emissions. Emissions testing protocols are beginning to evolve to evaluate building materials and products. Ask distributors for products with actual emission testing from protocols such as CA 1350 or GreenGuard. This standard will evolve in that direction as more tested products enter the marketplace.

Avoid paints with added antimicrobials.

Avoid field applied painting entirely by using pre-finished metals.

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1 point

EQ Credit 4.3

Low-Emitting Materials: **Flooring Systems**

Intent

Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.

Health Issues

Volatile organic compound emissions (VOCs) from flooring systems contribute to lowering indoor and outdoor air quality and negatively affecting human health. These VOCs and the carcinogens and reproductive toxicants that are also limited here represent a serious health risk to both the installers and the building occupants. The at-risk populations in a health care system with impaired immune, respiratory, and neurological systems are particularly vulnerable to poor indoor environmental conditions. Children, pregnant women, the elderly, and those with allergies, asthma or chemical sensitivities are also at increased risk of suffering adverse health effects from poor indoor environmental quality. Latex backings are restricted in this credit also due to potential allergenic reactions and the growing problem of latex sensitivities in health care settings for staff and patients.

Credit Goals

- Use only carpet and resilient flooring systems that meet or exceed the indoor air quality requirements of:
  - California's Special Environmental Requirements, Specifications Section 01350, updated with California DHS Standard Practice CA/DHS/EHLB/R-174 and using the standard office building protocol parameters.

OR

  - The Carpet and Rug Institute (CRI) "Green Label Plus".
- Testing should be done on whole assemblies of flooring with the adhesive, if any, that will be utilized in the installation.
- Use only adhesives and sealants with no carcinogen or reproductive toxicant components present at more than 1% of total mass of the product as defined in the following lists:
  - CA OEHHA, Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65).
  - CA Air Resources Board (ARB), list of Toxic Air Contaminants (California Air Toxics).
- Use only carpets with no natural rubber latex in the backing.

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EQ Credit 4.3 continued

Low-Emitting Materials: Flooring Systems

Documentation

- q Obtain documentation that all the carpet and resilient flooring systems have been tested by an independent indoor air quality testing laboratory and modeled to comply with the Section 1350 Reference Specifications for Energy and Resource Efficiency indoor air quality requirements as established by the State of California for the standard office building or one with similar size, ventilation and loading. Assure that tests have been performed within the last twelve months. Listing on the CHPS Low-Emitting Materials Compliant Materials Table or the Carpet and Rug Institute (CRI) “Green Label Plus” listing may be accepted in replacement for actual test data.
- q Obtain documentation that all adhesives and sealants do not exceed the content limits for carcinogenic or reproductive toxicant substances.
- q Obtain documentation that all carpets do not include natural rubber latex in the backing.

Reference Standards

Collaborative for High Performance Schools, Section 01350 Special Environmental Requirements, http://www.chps.net/manual/documents/Sec_01350.doc.

DHS Standard Practice CA/DHS/EHLB/R-174 www.dhs.ca.gov/ps/deodc/ehlb/iaq/VOCS/Practice.htm.

CA Office of Environmental Health Hazard Assessment (OEHHA) Chronic Reference Exposure Limits (REL), www.oehha.ca.gov/air/chronic_rels/AllChrels.html.

CHPS Low-Emitting Materials Compliant Materials Table, www.chps.net/manual/lem_table.htm.

“Green Label Plus" Carpet Testing Program - Approved Products,
www.carpet-rug.com/News/040614_GLP.cfm.

Potential Technologies & Strategies

Specify low-VOC carpet and resilient flooring products and systems in construction documents. Ensure that all carcinogenic or reproductive toxicant and other VOC limits are clearly stated where carpet and resilient flooring systems are addressed.

The Carpet and Rug Institute (CRI) “Green Label Plus" program uses most aspects of the 1350 protocol, with the exception of the 1350 stipulation to report out actual chemical concentrations - it is purely a pass-fail based upon a standard office building specification.
Give preference to materials tested by an independent lab in accordance with “Green Label Plus” or using California DHS Standard Practice CA/DHS/EHLB/R-174 for office buildings. If using the “Green Label Plus” certified materials, consider requiring submission of the actual test data from the manufacturer to inform material comparisons.

Note: GreenGuard also provides an evaluation standard for resilient floorings. The GGHC Steering committee is monitoring the debate about the relative efficacy of the 01350 standard and GreenGuard standards and will adjust this credit appropriately as that debate transpires.

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1 point

EQ Credit 4.4

Low-Emitting Materials: **Composite Wood & Insulation**

Intent

Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.

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Health Issues

Formaldehyde (HCHO) emissions from casework and other composite wood contribute to lowering indoor and outdoor air quality and negatively affecting human health. Formaldehyde is listed by the U.S. EPA as a probable human carcinogen and by the National Institute for Occupational Safety as a workplace carcinogen. Formaldehyde exposure can result in a range of health effects to both installers and building occupants including: irritation to the mucous membranes, including the eyes and respiratory tract; sensitization resulting in asthma symptoms (e.g., wheezing and chest congestion) and skin reactions; and carcinogenicity. The at-risk populations in a health care system with impaired immune, respiratory, and neurological systems are particularly vulnerable to poor indoor environmental conditions. Children, pregnant women, the elderly, and those with allergies, asthma or chemical sensitivities are also at increased risk of suffering adverse health effects from poor indoor environmental quality.

Credit Goals

- Composite wood and agrifiber products, including core materials, and insulation must contain no added urea-formaldehyde resins. Adhesives used to fabricate laminated in field- and shop-fabricated assemblies containing these products must contain no urea-formaldehyde.

Documentation

q Obtain documentation, confirming that all the composite wood, casework, fiberglass, insulation (both acoustic and thermal), agrifiber products and furniture finishes used in the building contain no added urea-formaldehyde resins.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Review the MSDS and other printed literature accompanying building materials and products, especially for composite wood products, casework, fiberglass products, insulation (both acoustic and thermal) agriboard products, and furniture finishes to ensure that no added urea-formaldehyde was used in the products' manufacture. Specify and use urea-formaldehyde-free substitutes that achieve equal or superior performance.

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1 point

EQ Credit 4.5

Low-Emitting Materials: **Furniture & Medical Furnishings**

Intent

Reduce the use of furniture including medical furnishings that may release indoor air contaminants that are odorous or potentially irritating and may be deleterious to installer and occupant health, comfort and well-being.

Health Issues

Volatile organic compounds (VOCs) and other chemical emissions from furniture systems contribute to lowering indoor and outdoor air quality and negatively affect human health. These VOCs and the carcinogens and reproductive toxicants that are also limited here represent a serious health risk to both the installers and the building occupants. Urea formaldehyde is targeted as an issue of particular concern as a widely used resin that is a known carcinogen and also poses respiratory and allergic health risks. An increasing body of evidence likewise points to an association of asthma and other bronchial problems with exposure to phthalates, in addition to their known reproductive system hazards.

In addition, several persistent bioaccumulative toxicants often used in furniture products are being found at levels of concern in the general population and are raising serious health concerns. There is growing evidence that many of the brominated flame retardants (BFRs) used to counteract the high flammability of plastics have toxic properties in animal studies akin to chlorinated persistent bioaccumulative toxicants such as dioxin and PCBs, including immune suppression, endocrine disruption, nervous system disorders, and cancer. Of particular concern are the polybrominated diphenyl ethers (PBDEs) widely used in furnishings. Likewise the perflourochemicals (PFCs) used directly in the manufacture of many stain protection and non stick treatments, most notably perfluorooctanoic acid (PFOA), or resulting as a breakdown product, are showing up in human blood samples in increasing frequency and are demonstrating a parallel broad range of toxicological effects in animal studies.

The at-risk populations in a health care system, including children, pregnant women, the elderly, and those with allergies, asthma, chemical sensitivities or otherwise impaired immune, respiratory, and neurological systems are particularly vulnerable to poor indoor environmental conditions.

Credit Goals

- Select a minimum of 40% (by cost) of all furniture and medical furnishings (including mattresses, foams, panel fabrics and other textiles) that do not contain at least three of the four listed materials:
  - Polybrominated diphenyl ethers (PBDE)
  - Perfluorooctanoic acid (PFOA)
  - Urea formaldehyde
  - Phthalate plasticizers

OR

- That do not contain at least two of the four listed materials and either:

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EQ Credit 4.5 continued

Low-Emitting Materials: **Furniture & Medical Furnishings**

- Meet or exceed the indoor air quality requirements of California's Special Environmental Requirements, Specifications Section 01350, and using the standard office building protocol parameters. *(Note: at the release of Version 2.0 the 01350 standard is not yet applicable to furniture. California DHS is in the process of establishing a Standard Practice for furniture. This goal will not be applicable until that time.)*

  OR

  - Are certified by GreenGuard.

- Prepare specification language identifying the BFR free goal to the furniture dealer/contractor for the aforementioned material categories and indicating that review of material content will be a criterion in all substitution reviews.

Documentation

q Obtain documentation listing product description (all components) and complete matrix indicating how many of the criteria are met for each furnishing group.

q If applicable, obtain test results of the furniture assemblies tested in accordance with the noted CA 01350 protocol or GreenGuard indicating that the emissions limits have not been exceeded. Test results must be current within twelve (12) months of the project specification, and must be dated and signed by an officer of the independent laboratory where the testing was conducted,

Reference Standards

Collaborative for High Performance Schools, Section 01350 Special Environmental Requirements, http://www.chps.net/manual/documents/Sec_01350.doc.

CA Office of Environmental Health Hazard Assessment (OEHHA) Chronic Reference Exposure Limits (REL), http://www.oehha.ca.gov/air/chronic_rels/AllChrels.html.

Testing Requirements For Volatile Organic Compound Emissions, DGS Environmental Specifications for Office Furniture Systems, http://www.ciwmb.ca.gov/greenbuilding/Specs/Furniture/.

GreenGuard, www.greenguard.org.

Potential Technologies & Strategies

Ensure that the material limitations plus the VOC and other chemical limit standards of the 01350 specification and GreenGuard are clearly stated in each section where furniture is specified.

BFRs are rarely listed on material sheets and PFCs are most commonly used as a process chemical or are a break down product, so show up as a contaminant rather than a final ingredient. Determining association of these chemicals with furniture may require direct discussion with manufacturers. PFCs are used most commonly in common stain and non-stick treatments, including Scotchguard®, Teflon®, Stainmaster®, Scotchban®, and Zonyl®.

Avoid all brominated flame retardants (BFRs), including not only PBDEs, but also TBBPA, HBCD and others. One potential strategy is to specify seating with mesh and no foam to meet the PBDE-free goal.

1 point

EQ Credit 4.6

LowEmitting Materials: **Exterior Applied Products**

Intent

Protect installers and building occupants and safeguard air quality resulting from exposure to hazardous and/or odorous substances used during construction.

Health Issues

Health care construction rarely occurs on undeveloped sites remote from ongoing existing operations. In most instances, construction operations are proximate to existing operational health care facilities, where construction practices have health impacts on adjacent building occupants and building system performance.

There are potential hazards associated with the installation of roofing and solvent-based materials, including hot-applied materials, such as coal tar and asphalt roofing and waterproofing bitumens as well as VOC emissions from single-ply systems. These potential hazards contribute to lowering indoor and outdoor air quality and represent a serious health risk to both the installers and the building occupants. The at-risk populations in a health care system with impaired immune, respiratory, and neurological systems are particularly vulnerable to poor indoor environmental conditions. Children, pregnant women, the elderly, and those with allergies, asthma or chemical sensitivities are also at increased risk of suffering adverse health effects from poor indoor environmental quality.

Credit Goals

- Specify and use coatings, roofing and waterproofing materials that meet or are lower than the VOC limits of Bay Area Air Quality Management District Regulation 8, Rule 51 & Rule 3.
- Contain or eliminate through material selection, odors, fumes, vapors or other emissions produced by outdoor construction processes (i.e., bituminous roofing and waterproofing) from infiltrating occupied areas. Comply with procedures established by NIOSH Publication No. 2003-112: Asphalt Fume Exposures During the Application of Hot Asphalt to Roofs.

Documentation

q Prepare a written containment plan for isolating potentially hazardous or odorous substances occurring during construction to insure that they do not migrate in occupied areas and evidence of implementation.

q Obtain a cut sheet and a Material Safety Data Sheet (MSDS) for each material used in the building highlighting VOC limits.

Reference Standards

Bay Area Air Quality Management District Regulation 8, Rule 51 & Rule 3, http://www.baaqmd.gov/dst/regulations/index.asp.

NIOSH Publication No. 2003-112: Asphalt Fume Exposures During the Application of Hot Asphalt to Roofs.

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EQ Credit 4.6 continued

Low-Emitting Materials: **Exterior Applied Products**

Potential Technologies & Strategies

Periodically monitor outdoor air quality at intakes during construction to insure that outdoor air contaminants are not entering the building systems. Routinely inspect air intakes and plenums leading to work area. Establish containment barriers to isolate the work area from occupied areas. Seal all openings between contained areas and adjacent areas, including but not limited to windows, doorways, elevator openings, corridor entrances, drains, grates and skylights, with exceptions of the means of entry and exit.

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1 point

EQ Credit 5.1

Chemical & Pollutant Source Control: **Outdoor**

Intent

Avoid exposure of building occupants to potentially hazardous outdoor soils and pollutants that adversely impact air quality and human health.

Health Issues

Hospitals are particularly vulnerable to indoor air quality threats, as many patients are immuno-compromised and have increased chemical susceptibilities. Indoor air pollution often begins with unintended outdoor pollutants penetrating the building envelope. Health care buildings are highly trafficked, with large numbers of staff and visitors entering the building. Vehicular traffic patterns often include idling vehicles near major entryways.

Credit Goals

Design to minimize pollutant contamination of regularly occupied areas due to exterior factors:

- Specify textured paving for outside approaches in accordance with accessibility and safety protocols, so that soils are scraped off shoes prior to entering building.
- Employ permanent entryway systems (grilles, grates, etc) to capture dirt, particulates, etc. from entering the building at all high volume entryways and, at a minimum, removable entryway systems at all entrances. Develop the associated cleaning, maintenance and replacement strategies to maintain those entryway systems.
- Establish all HVAC equipment air intakes a minimum distance from the following sources and a minimum of 10 feet above finish grade:
  - Minimum of 50' from loading docks, ambulance bays, and entrances where vehicles are arriving or leaving. Prohibit idling in these locations.
  - Minimum of 50' from loading docks, ambulance bays, and entrances where vehicles are arriving or leaving. Prohibit idling in these locations.
  - Minimum of 50' from vegetation/ landscape subject to pesticide or herbicide applications
  - Minimum of 100' from helipads.
  - Minimum of 50' from designated smoking areas (see EQ Prereq 1).
  - Minimum of 50’ from other sources of potential air contaminants.

Documentation

q Compile a building plan showing all high volume entryways of installed permanent entryway systems (grilles, grates, etc).

q Compile a building plan indicating location of all fresh air intakes and their distances from all sources of exterior contaminants.

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EQ Credit 5.1 continued

Chemical & Pollutant Source Control: **Outdoor**

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Minimize introduction of dirt with appropriately sized, recessed metal grating or similar entryway system within vestibules. Install additional "walk-off mats" in entryways to prevent dirt from entering the building.

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1 point

EQ Credit 5.2

Chemical & Pollutant Source Control: **Indoor**

Intent

Avoid exposure of building occupants to potentially hazardous indoor pollutants and chemicals that adversely impact air quality and human health.

Health Issues

Hospitals are particularly vulnerable to indoor air quality threats, as many patients are immuno-compromised and have increased chemical susceptibilities. Equally important, the Joint Commission on the Accreditation of Health Care Organizations (JCAHO) has expressed increasing concern over growing respiratory issues among health care workers. JCAHO has identified indoor chemical pollutants as a contributing factor to indoor air quality issues, including photocopiers, glutaraldehyde and ethylene oxide sterilants, xylene, aerosolized medication distribution systems, anesthetic gases, chemotherapeutic agents, latex, cleaners and floor finishes.

Credit Goals

Design to minimize pollutant cross-contamination of regularly occupied spaces:

- Where chemical use occurs (including soiled utility areas, sterilization areas, housekeeping areas and copier areas), establish segregated areas with deck to deck partitions and separate outside exhaust of at least 0.50 CFM per square foot, (for rooms containing disinfectant and sterilant applications, provide minimum 12 air changes/hour) no air re-circulation and maintain a negative pressure compared with the surrounding spaces of at least an average of 5 Pa (0.02 inches of water gauge) and with a minimum of 1 Pa (0.004 inches of water) when the door(s) to the room(s) are closed.
- Establish regularly occupied areas of the building with new air filtration media prior to occupancy that provide a Minimum Efficiency Reporting Value (MERV) of 13 or better.

Documentation

- q Compile a building plan showing all rooms where chemical mixing occurs, and that all chemical use areas and copy rooms have been physically separated with deck to deck partitions; independent exhaust ventilation has been installed at 0.50 cfm/square foot (for rooms containing disinfectant and sterilant applications, a minimum of 12 air changes/hour shall be provided) and that a negative pressure differential has been achieved.
- q Compile a listing of each filter that must be installed prior to occupancy including the MERV requirements value, manufacturer name and model number.
- q Include review of equipment locations as part of the initial building commissioning plan.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Isolate potential pollution sources through separate zoning of areas where contaminants are generated. Locate copiers, fax machines and other office equipment in spaces with direct exhaust ventilation. In diagnostic and treatment areas, include utility rooms with negative pressure and direct exhaust to accommodate sterilization systems and other medical equipment that require chemical use.

1 point

EQ Credit 6.1

Controllability of Systems: **Lighting**

Intent

Provide a high level of temperature and ventilation or lighting system control by individual occupants, or by specific groups in multi-occupant spaces (i.e., holding and recovery areas, treatment spaces, patient rooms), to promote the productivity, comfort and well-being of building occupants.

Health Issues

Building occupants' health is directly impacted by the degree of control that individuals can exercise over their immediate environment. Given the wide range and variety of individuals receiving care, patient or resident control cannot be extended to all elements of the physical environment. Because the sense of loss of control can be disturbing and stressful to patients or residents and their family members, every effort should be made to allow individual control over as many elements of the environment as possible and reasonable, including but not limited to temperature, lighting, and privacy. Control over lighting, window treatments, and temperature directly impacts the quality of the experience of the interior environment. Occupant control of ventilation or air flow may conflict with regulatory requirements for ventilation rates and pressurization in health care environments.

Credit Goals

- Provide individual lighting controls for 90% of the building occupants. Automatic daylight dimming controls must be provided for permanently installed lighting that is within 15 feet inside of and 2 feet to either side of all windows and 10 feet around skylights and 10 feet from the exterior face of clerestories.

Documentation

q Compile controls schematic drawings demonstrating that the required lighting controls are provided.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Design the building with occupant controls for temperature and lighting. Strategies to consider include lighting controls, task lighting, operable windows where practical, and thermostats.

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1 point in addition to EQ Credit 6.1

EQ Credit 6.2

Controllability of Systems: **Thermal & Ventilation**

Intent

Provide a high level of temperature and ventilation or lighting system control by individual occupants, or by specific groups in multi-occupant spaces (i.e., holding and recovery areas, treatment spaces, patient rooms), to promote the productivity, comfort and well-being of building occupants.

Health Issues

The health of building occupants is directly impacted by the degree of control that individuals can exercise over their immediate environment. Control over temperature directly impacts the quality of the experience of the interior environment. Studies have shown that occupant control over the immediate thermal environment positively impacts patient and staff satisfaction, while decreasing overall energy consumption.

Occupant control of ventilation or air flow may conflict with regulatory requirements for ventilation rates and pressurization in health care facilities.

Credit Goals

- Establish individual temperature and ventilation controls for 50% of the occupants. Operable windows can be used in lieu of individual controls for areas that are 20 feet inside of and 10 feet to either side of the operable part of the window. The areas of operable window must meet the requirements of ASHRAE 62-2001, paragraph 5.1.

Documentation

q Compile controls schematic drawings demonstrating the required individual ventilation and temperature controls are provided.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Design the building with occupant controls for airflow, temperature and lighting. Strategies to consider include underfloor HVAC systems with individual diffusers, displacement ventilation systems and operable windows.

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1 point

EQ Credit 7

Continuous Comfort Monitoring System

Intent

Provide a thermally comfortable environment that supports the productivity and well-being of building occupants.

Health Issues

Occupant comfort is an essential component of healthy and productive indoor environments. By optimizing thermal control, including humidity control, there are documented improvements in occupant health, including improved respiratory function, and reduced mold and mildew growth. This is particularly important in hospitals, where patients are likely to have suppressed immune systems or other illnesses that make them more vulnerable to poor indoor environmental conditions.

Credit Goals

- Provide a permanent monitoring system to ensure thermal comfort criteria as determined by EQ Prerequisite 4 Thermal Comfort – Compliance.

Documentation

- q Obtain documentation that identifies the comfort criteria, strategy for ensuring performance to the comfort criteria, description of the permanent monitoring system implemented, and process for corrective action as may be appropriate.
- q Verify that the temperature and humidity controls were (or will be) tested as part of the scope of work for Energy and Atmosphere Prerequisite 1, Fundamental Building Systems Commissioning. Include the document name and section number where the commissioning work is listed.

Reference Standards

ASHRAE Standard 55-2004

Potential Technologies & Strategies

Develop a strategy and implement systematic monitoring of the actual performance of the building to the comfort criteria selected per IEQ Credit 7.1. As appropriate, monitoring may include measurement and trending of temperatures, relative humidity or air speed selected according to their variability and impact on occupant comfort, or annual validation of continued performance to the selected comfort criteria conducted per ASHRAE Standard 55-2004, Section 7 Validation of the Thermal Environment.

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5 points

EQ Credit 8.1

Daylight & Views: **Daylight for Occupied Spaces**

Intent

Provide building occupants with a connection between indoor spaces and the outdoors by introducing daylight and views into the building's regularly occupied areas.

Health Issues

Americans now spend almost 90% of their time indoors. Increasingly, studies are beginning to postulate and link a range of health issues with inadequate exposure to light or inappropriate light-dark cycles. The distinction between daylit and electrically lit spaces is much more significant than is often acknowledged: daylight intensity levels are in the range of 10,000 to 40,000 lux, while a brightly lit interior averages between 300 and 500 lux. Daylight changes and modulates not only in intensity but also in spectrum and creates cues for the passage of time with continuously changing shadow patterns.

Benefits of natural light in hospitals and health care facilities include improved physiological and psychological states for both patients and staff. Studies show that daylighting can reduce the stress experienced by caregivers, patients and families.

Studies also indicate that daylighting can reduce post surgical recovery time. Moreover, in certain illnesses, the human biological clock or the circadian system plays an important role in maintaining the well-being of the individual by alleviating depression, improving night sleep quality, alertness and performance quality. In Alzheimer's patients, for example, exposure to bright lights during the day consolidates night time sleep, which in turn reduces the stress on caregivers. "ICU psychosis", a state of delirium experienced in critical care environments, is dramatically reduced when spaces are daylit.

Daylighting in long term care facilities is beneficial in maintaining calcium levels, sleep patterns among elderly, and higher ambient lighting levels required for the aging eye (glare should be prevented). Recent studies have linked the quality of light to the quality of life for frail elderly.

Credit Goals

- Diagnostic and Treatment Areas: Establish the following planning thresholds to provide access to daylight for regularly occupied space as follows. Using the table below that corresponds to overall floor plate area; design the building to provide the following percentages of area within 15 feet of a window on the perimeter. Courtyards or atria with a minimum width of 10 feet per vertical story qualify as perimeter. This calculation is based upon a percentage of total floor area (building GSF), and is independent of function or layout. If the perimeter varies between stories, the total floor area can be used and averaged (for example: in a 2 story building of 14,000 sf per floor, one story at 40% and one story at 80% would average to 60%, achieving 2 points in the "below 20,000 sf" category):

Criteria percent of total floor area within 15' of perimeter window by total size					
Point Total	**Below 20,000 sf**	**20,000 to 30,000 sf**	**30,000 to 40,000 sf**	**40,000 to 50,000 sf**	**Above 50,000 sf**
1 point	48%	44%	40%	37%	34%
2 points	56%	51%	46%	42%	38%
3 points	64%	58%	52%	47%	42%

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EQ Credit 8.1 continued

Daylight & Views: **Daylight for Occupied Spaces**

- Inpatient Units (2 points): Provide access to daylight on inpatient units as follows:
  - 1 point: Provide access to daylight for 90% of patient and public spaces, subject to the following requirements: In multi-bed rooms, provide a window configuration to ensure that both patients have visual connection to the outdoors, even when cubicle curtains are closed.
  - 1 point: Achieve a Daylight Factor of 2% for 75% of staff occupied areas, including nursing stations, lounges, conference rooms, etc.
- Distance from exterior walls may be increased if a Daylight Factor of 2% can be maintained at greater distance from the perimeter through the use of light shelves or other technologies. Glazing in exterior walls shall be in accordance with Credit 8.2 Views. In perimeter corridor solutions, only the corridor area will be considered unless spaces adjoining the corridors have glazing in accordance with Credit 8.2. Glazed spaces overlooking atria are exempted from the 2% Daylight Factor goal.

Documentation

q Compile area calculations that define the percentages achieved and with prediction calculations.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Design the building to maximize interior daylighting. Insure compliance with the goal early in the design process, acknowledging site constraints at the programming stage, when block planning is tested and initial design parameters are established.

Strategies to consider include building orientation, shallow floor plates, increased building perimeter, courtyards, atria and light wells. Daylighting efficacy can be improved with use of exterior and interior permanent shading devices, high performance glazing, light shelves, high performance window treatments and photo-integrated light sensors. Predict daylighting via calculations or model daylighting strategies with a physical or computer model to assess foot-candle levels and daylight factors achieved.

Resources

Verderber, S (February, 1983) “Human Response to Daylighting in the Therapeutic Environment.” 1983 International Daylighting Conference. Phoenix, AZ: General Proceedings, pg. 415.

Edwards, L. and Torcellini, P. A Literature Review of the Effects of Natural Light on Building Occupants, National Renewable Energy Laboratory, Golden, CO, July, 2002. NREL/TP-550-30769. Chapter 8, Daylighting in Health Care.

Daylight in Buildings: A Source Book on Daylighting Systems and Components, International Energy Agency Solar Heating and Cooling Programme, July, 2000, www.iea-shc.org.

Heschong Mahone Group, Daylighting in Schools: An Investigation into the Relationship between Daylight and Human Performance, A Report to Pacific Gas and Electric Company, August, 1999, www.h-m-g.com.

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1 point

EQ Credit 8.2

Daylight & Views: **Building Orientation**

Intent

Connect patients, visitors, and staff to the natural environment.

Health Issues

Research shows that physical and visual connections to the natural environment (access to outdoor space, views of nature, natural daylighting) provide social, psychological, and physical benefits. Such connections also assist in patient recovery and healing, reduce stress, and improve the overall health care environment. Similar benefits accrue to the staff, thus leading to improved delivery of services to the patients they serve.

Credit Goals

- Assess the site and surrounding area and develop a master plan for incorporating ways of experiencing significant natural features (on-site and distant) into the overall site and building planning. Incorporate nature as an essential element of the building design in order to enhance the healing process.

Documentation

q Compile plans demonstrating site planning principles to maximize the experience of significant natural features for therapeutic value.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Strategies include building orientation and siting, and the siting and layout of all site development elements (e.g., arrival drive, drop-off, parking, site amenities). Strategies also include window placement in treatment settings, patient rooms and other therapeutic environments. Identify and prioritize the sites' natural attributes that are to be protected, conserved, or restored as components of this experience.

Identify microclimates and provide a progression of protective, flexible settings to encourage use throughout the year.

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1 point

EQ Credit 8.3

Daylight & Views: **Views for Occupied Spaces**

Intent

Provide building occupants with a connection between indoor spaces and the outdoors by introducing daylight and views into the building's regularly occupied areas.

Health Issues

Views from windows have been cited in medical literature as having psychotherapeutic qualities through both the visual qualities and natural lighting components; environments with access to views are often characterized as "more therapeutic" (Vischer 1986; Verderber 1983). Regulations require that patient sleeping rooms contain windows, with some exceptions. Aside from these areas, there are virtually no additional regulations that mandate light and views for occupied spaces in health care settings, despite the evidence based research concerning the benefits.

Credit Goals

- Establish direct line of sight to vision glazing for building occupants in 90% of all staff occupied areas including offices, corridors, nursing stations, break rooms, cafeterias, and lobbies.
  - Areas directly connected to perimeter windows must have a glazing-to-floor area ratio of at least 0.07. Parts of the floor area with horizontal view angles of less than 10 degrees at 50 inches above the floor cannot be included in this calculation. End of corridor windows fulfill the goal for unobstructed length of the corridor.
  - Spaces not directly connected to perimeter windows must have a horizontal view angle of less than 10 degrees at 50 inches above the floor involving 50% or more of the room area. If the room meets these goals then the entire room area is considered to meet the view goal.
  - Exceptions to the goals include diagnostic and treatment rooms (if controlled environment prohibits introduction of natural light), copy rooms, storage areas, utility rooms, mechanical, and laundry rooms.

Documentation

q Compile diagrams describing and demonstrating that the building occupants in 90% of regularly occupied spaces will have direct lines of site to perimeter glazing.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Implement design strategies to provide line of sight access to exterior, such as glazing in corridors, borrowed light vision panels between perimeter spaces and building core areas.

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1 point

EQ Credit 8.4

Daylight & Views: **Lighting & Circadian Rhythm**

Intent

Improve alertness levels, work performance, staff satisfaction and health, and reduce medical errors, by providing lighting systems based on circadian rhythm.

Health Issues

While health care facilities often focus on public space lighting, the actual interior treatment areas and working environments are often overlooked. During the day, lighting in staff work areas fails to stimulate work performance, and during the night the lighting fails to support high levels of alertness. Intermittent exposure to bright light or creating "light showers" are proven techniques in shift work environments to reduce fatigue, improve alertness, and improve cognitive functioning in night shift staff. The normal function of the body at night is to produce high levels of melatonin, resulting in sleepiness. When lighting does not assist the body in adjustment to night shift work, the circadian system becomes desynchronized, contributing to low alertness and deteriorated work performance. Other observed symptoms are sleep disturbance, carbohydrate cravings, confusion or loss of coordination, and susceptibility to infectious disease.

Credit Goals

- Establish electric lighting systems and controls for patient areas and staff work areas based upon principles of circadian rhythm (a self-sustained biological rhythm that in an organism's natural environment normally has the period of approximately 24 hours).
- In patient areas, establish lighting design solutions that allow for variation in day and night lighting characteristics.
- In staff areas, establish lighting to support work performance and alertness through both daytime and night lighting cycles. Implement a no rotation work routine to be able to address the needs of the day and the night shift appropriately.
- Establish ambient and task lighting that is variable spectrum, free of glare, and task oriented. Where daylight is not achievable, provide electric lighting systems that simulate daylight, brightness and diurnal variation, and allow individual and central lighting control systems.

Documentation

- q Compile drawings and specification information outlining the lighting system design for staff work areas, with documentation supporting how the lighting system responds to circadian rhythm.

Reference Standards

There is no reference standard for this credit.

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EQ Credit 8.4 continued

Daylight & Views: **Lighting & Circadian Rhythm**

Potential Technologies & Strategies

For staff areas subject to night work, a short intermittent exposure to higher level of light is beneficial. Insure that bright light is available. Provide for variability of lighting characteristics such as intensity, spectrum (from cool to warm light) and distribution shifting levels of light throughout the night hours, with variability in lighting color from cool to warm. Prevailing indirect light with too little direct component will result in sleepiness.

In patient areas without daylight, provide lighting that varies throughout the day. Systems should allow light levels to gradually increase and decrease throughout the day hours, moving from warm to cooler and back again. Provide individual controls that allow patients to reset or alter the lighting. Provide dimming capacity.

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1 point

EQ Credit 9

Acoustic Environment

Intent

Provide building occupants with a healing environment free of disruptive levels of sound.

Health Issues

Noise is a well documented source of stress in health care settings. Noise from personnel, equipment, and visitors impacts patient privacy and sleep patterns. In turn, noise increases stress levels for patients and caregivers. Research finds that in hospitals that reduced noise levels, the patients' satisfaction with care giving increased, their sleep improved, and their blood pressure lowered; similarly, staff in low-noise environments were more positive about their jobs and indicated improved sleep.

The World Health Organization recommends that continuous background noise in hospital rooms should not exceed 35 decibels (dB), and nighttime peaks in patient care areas should not exceed 40 dB. Studies have found that background noise levels typically are in the range of 45 to 68 dB and many peaks commonly exceed 90 dB.

Credit Goals

- Specify materials, products, mechanical systems and design features to attenuate sound and vibration, and not to exceed Room Criteria (RC) ratings listed for Hospital and Clinics in Table 34 of Chapter 46, Sound and Vibration Control, 1999 ASHRAE Application Handbook.
- Select ceiling tiles with an NRC (Noise Reduction Coefficient) above .85 and a CAC (Ceiling Attenuation Class) of at least 35.
- Test sound levels as a component of Building Commissioning.

Documentation

q Obtain documentation that sound and vibration will not exceed Room Criteria (RC) ratings listed for Hospital and Clinics in Table 34 of Chapter 46, Sound and Vibration Control, 1999 ASHRAE Application Handbook.

q Indicate sound transmission ratings on all interior partition types and ceiling selections.

Reference Standards

Sound and Vibration Control, 1999 ASHRAE Application Handbook Chapter 46.

Potential Technologies & Strategies

In nursing unit planning, avoid locating patient rooms adjacent to elevators, stairwells, nurse stations, and visitor/ public spaces. Acoustically isolate patient rooms from each other and from the corridor. Locate televisions in public and staff areas only where there is adequate space for patients and staff to be out of hearing range if they so choose. Provide headsets for televisions and radios located in semi-private rooms or other locations where sound can carry to other patients.

Select hard surface flooring products for best acoustic properties. Use sound absorbing finish materials in waiting areas and other public spaces adjacent to patient units. In open bay treatment areas, such as Emergency Departments or Recovery rooms, select ceiling products for best acoustic properties. At nurse stations and open staff areas, carefully integrate sound absorbing elements (ceilings, furniture systems, etc.) to reduce noise.

Isolate anchorage of vibration generating equipment from the building structure. Locate noise generating mechanical and electrical equipment away from patient and staff areas, and from neighboring residential communities.

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Innovation in Design

4 points

IN Credit 1
Innovation in Design

Intent

To provide design teams and projects the opportunity to achieve points for exceptional performance above credit goals set by the *Green Guide for Health Care* and/or innovative performance for Green Building strategies not specifically addressed by the *Green Guide for Health Care*.

Health Issues

The relationship between buildings and health is continuously evolving. The health care industry is uniquely positioned to evolve ever more powerful and innovative strategies to enhance building performance. These credits are intended to reward exemplary performance of existing credits and encourage implementation of innovative design elements.

Credit Goals

Credit 1.1 (1 point)	Identify the **intent** of the proposed innovation credit, the proposed **credit goal** for compliance, the proposed **submittals** to demonstrate compliance, and the **design approach** used to meet the required elements.
Credit 1.2 (1 point)	Same as Credit 1.1.
Credit 1.3 (1 point)	Same as Credit 1.1.
Credit 1.4 (1 point)	Same as Credit 1.1.

Documentation

q Prepare the proposal(s) (including intent, credit goal, submittals and design approach) and relevant evidence of performance achieved.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Substantially exceed a GGHC credit threshold such as for energy performance or water efficiency. Apply strategies or measures that are not covered by GGHC such as education of occupants, community development or adding additional toxics screens to material choices.

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Operations Credits

Intent

The *Green Guide for Health Care* has developed specific credits related to operations and maintenance as a critical component of a sustainable design program. The organizational intent for this inclusive approach is summarized as follows:

- Most health care construction projects are undertaken by existing institutions that already have ongoing operations and maintenance protocols in place, even if the project that is the subject of this application is a free-standing new building on a clean site.
- The distinction between existing buildings and new construction in health care is often complex and difficult to precisely define, while high performance building standards often rely on this distinction for including operations and maintenance considerations. Operations aimed at reducing the facilities environmental footprint often yield substantial economic benefits for institutions.

Health Issues

Acute and long-term health care facilities operate on a continuous, 24-hour, 7-day basis. Consequently, many operations and maintenance tasks are performed with staff and patients in occupancy, where it is challenging, if not impossible, to isolate building occupants from associated environmental health impacts. Thus, building operations, construction operations and maintenance procedures must be evaluated relative to health impacts on patients, who are often immunocompromised and vulnerable to environmental issues, and on staff, whose responsibility to provide critical care should not be impeded by a compromised indoor environment. The Joint Commission on the Accreditation of Hospitals (JCAHO) recognizes the occupational health issues for staff working in these built environments.

Organization

The *Green Guide* Operations section is organized in accordance with commonly understood areas of responsibility in health care organizations. Each credit corresponds to a distinct aspect of the operation of health care facilities; within each credit, a series of points define a range of opportunities and strategies to reduce the environmental footprint of the health care facility's ongoing operation.

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Integrated Operations

Required **IO Prerequisite 1**

Integrated Operations & Maintenance Process

Intent

Demonstrate a cross discipline approach in Operations and Maintenance decision-making and implementation to ensure safe, healthful, environmentally sensitive methods and materials.

Health Issues

Acute and long term health care facilities operate on a continuous, 24-hour, 7-day basis. Consequently, many operations and maintenance tasks are performed with staff and patients in occupancy, where it is challenging, if not impossible, to isolate building occupants from associated environmental impacts. Thus, building operations, construction operations and maintenance procedures must be evaluated relative to health impacts on patients, who are often immunocompromised and vulnerable to environmental issues, and on staff, whose responsibility to provide critical care should not be impeded by a compromised indoor environment. The Joint Commission on the Accreditation of Hospitals (JCAHO) recognizes the occupational health issues for staff working in these built environments.

Credit Goals

- Demonstrate functional cross discipline process for decision-making regarding safe, healthful and environmentally sensitive operations and maintenance and encourage continuous improvement.

Documentation

- Compile an Environmental Health Goals Statement for operations and maintenance procedures and protocols, encouraging continuous improvement.
- Define cross discipline decision making process for operations and maintenance decisions.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Organize and schedule regular meetings of all related operations groups to integrate functional processes into the daily operation of the facility that jointly consider environmental and health impacts of decisions and opportunities for continuous improvement.

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Required

IO Prerequisite 2

Recertification Process

Intent

Maintain the ongoing functional application of all design decisions and processes associated with the initial design certification.

Health Issues

Ongoing operations and maintenance procedures are inextricably linked to occupant health and safety. Monitoring O&M practices for consistency with original design intent and facility environmental/health policies helps to ensure that indoor air quality and mechanical performance standards are maintained.

Credit Goals

- Specify processes to monitor and document actual performance of each measure achieved in the initial design.

Documentation

q On a bi-annual basis, update performance data, policies and procedures and other required documentation to recertify compliance with Construction and Operations credit intents.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Address each credit individually, documenting current compliance or actual operational performance (as applicable).

Update the *Green Guide* Checklist on a periodic basis with a goal toward continuous improvement. (note italicized Green Guide)

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Required

IO Prerequisite 3

Environmental Tobacco Smoke (ETS) Control

Intent

Prevent exposure of building occupants and systems to Environmental Tobacco Smoke (ETS).

Health Issues

There are well-known health risks associated with Environmental Tobacco Smoke (or "secondhand smoke"). A 1993 report published by the United States EPA, *Respiratory Health Effects of Passive Smoking: Lung Cancer and Other Disorders,* concluded that secondhand smoke causes lung cancer in adult nonsmokers and impairs the respiratory health of children, corroborating earlier studies undertaken by the National Academy of Sciences and the U.S. Surgeon General. The EPA report classified secondhand smoke as a Group A carcinogen, indicating sufficient evidence of the substance causing cancer. Only 15 other substances, including asbestos, benzene and radon, carry the Group A carcinogen designation. Prohibiting smoking within buildings is the most effective way to avoid exposure to secondhand smoke.

Credit Goals

- Prohibit smoking in the building (except as noted below).
- Establish any exterior designated smoking areas at least 50 feet (15.24 meters) away from entries, operable windows, air intakes, bus stops, disabled parking, and other locations where occupants could inadvertently come in contact with ETS when occupying, entering or leaving the building.
- Only for residential facilities where the functional program requires accommodation for smokers may there be an exception to establish negative pressure smoking rooms:
  - Provide one or more designated smoking rooms designed to effectively contain, capture and remove ETS from the building. At a minimum, the smoking room must be directly exhausted to the outdoors with no re-circulation of ETS-containing air to the non-smoking area of the building, and enclosed with impermeable deck-to-deck partitions and operated at a negative pressure compared with the surrounding spaces of at least an average of 5 Pa (0.02 inches of water gauge) and with a minimum of 1 Pa (0.004 inches of water) when the door(s) to the smoking room are closed.
  - Performance of the smoking room differential air pressures shall be verified by conducting 15 minutes of measurement, with a minimum of one measurement every 10 seconds, of the differential pressure in the smoking room with respect to each adjacent area and in each adjacent vertical chase with the doors to the smoking room closed. The testing will be conducted with each space configured for worst case conditions of transport of air from the smoking rooms to adjacent spaces.

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IO Prerequisite 3 continued

Environmental Tobacco Smoke (ETS) Control

Documentation

- q Prepare a copy of the no-smoking policy.
- q Prepare a copy of the building site plan indicating designated smoking areas and their distances from entries, operable windows, air intakes, and other locations where occupants could inadvertently come in contact with ETS.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Prohibit smoking in the building and other locations where occupants could inadvertently come in contact with ETS. Take into account prevailing winds and micro-climate effects in siting exterior smoking areas.

Resources

US EPA, Respiratory Health Effects of Passive Smoking: Lung Cancer and Other Disorders
http://cfpub1.epa.gov/ncea/cfm/recordisplay.cfm?deid=2835.

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Required

IO Prerequisite 4

Outside Air Introduction & Exhaust Systems

Intent

Establish minimum indoor air quality (IAQ) performance to enhance indoor air quality in buildings, thus contributing to the health and well-being of the building occupants.

Health Issues

The EPA estimates that indoor air pollution is one of the top five environmental risks to public health and is as much as 10 times more polluted than outside air. Indoor air pollutants can cause problems ranging from immediate acute effects such as eye, nose, and throat irritation; sinusitis, asthma attacks, headaches; loss of coordination; and nausea; to long range chronic damage to the lungs, liver, kidney, and central nervous system and cancer.

Maintaining indoor air quality begins with careful monitoring of outside air at intakes into the indoor air distribution system, as well as the system's exhaust components.. Coupling properly designed, operated and maintained mechanical equipment with low-emitting materials can ensure healthy indoor air.

Credit Goals

- Modify or maintain existing building outside-air (OA) ventilation distribution system to supply, at a minimum, the outdoor air ventilation rate required by ASHRAE 62.1-2004. (ASHRAE 62.1.1-2001 with all Addenda can be used until ASHRAE 62.1-2004 is published.)

- Meet the EPA IAQ guidelines OR SMACNA IAQ guidelines for HVAC System Maintenance to ensure the proper operations and maintenance of HVAC components as they relate to IAQ.

- Test and maintain the operation of all building exhaust systems, including bathroom, utility areas, laboratories, kitchen and parking exhaust system.

Documentation

q Provide a letter and backup tabular information from a mechanical engineer or HVAC system specialist demonstrating that the existing building outside-air (OA) ventilation distribution system supplies at least the outdoor air ventilation rate required by ASHRAE 62.1-2004. (ASHRAE 62.1-2001 with all Addenda can be used until ASHRAE 62.1-2004 is published.).

q Provide a letter and backup tabular information from a mechanical engineer or HVAC system specialist demonstrating that the exhaust air HVAC systems serving the building are operating as designed.

q Provide the results of four quarterly inspections of the building OA/exhaust air system to verify that the system is operating as intended.

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IO Prerequisite 4 continued

Outside Air Introduction & Exhaust Systems

Reference Standards

ASHRAE 62.1-2004. (ASHRAE 62.1-2001 with all Addenda can be used until ASHRAE 62.1-2004 is published.)

Potential Technologies & Strategies

Conduct a visual inspection of OA air vent/dampers and remove any OA air vent/louver obstructions that restrict full OA capacity from entering the distribution system. Conduct airflow monitoring to document OA in terms of CFM. Compare measured flow to designed flow for each unit. Test the operation of each exhaust fan and verify that exhaust airflow meets design requirements/intents.

1 point

IO Credit 1.1

Building Operations & Maintenance: **Staff Education**

Intent

Support appropriate operations and maintenance of buildings and building systems to ensure they deliver target building performance goals over the life of the building.

Health Issues

Ongoing operations and maintenance procedures are inextricably linked to occupant health and safety. Monitoring O&M practices for consistency with original design intent and facility environmental/health policies helps to ensure that indoor air quality and mechanical performance standards are maintained.

Credit Goals

- Have in place over the performance period a building operations and maintenance staff education program that provides each staff person with primary building maintenance responsibilities with a minimum 24 hours of education each year over the performance period on building and building systems operations, maintenance, and achieving sustainable building performance. Training must be of high quality and relevant to building operations and maintenance.

Documentation

q Document the training received by building operations and maintenance staff listing the course titles and hours, and annual total training hours for each staff person and the calculated annual average training hours for all by building operations and maintenance staff.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Arrange on site or offsite training for building operations and maintenance staff that addresses building and building systems operation, maintenance, and achieving sustainable building performance.

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1 point

IO Credit 1.2

Building Operations & Maintenance: **Building Systems Maintenance**

Intent

Support appropriate operations and maintenance of buildings and building systems to ensure they deliver target building performance goals over the life of the building.

Health Issues

Ongoing operations and maintenance procedures are inextricably linked to occupant health and safety. Monitoring O&M practices for consistency with original design intent and facility environmental/health policies helps to ensure that indoor air quality and mechanical performance standards are maintained.

Credit Goals

- Have in place over the performance period a comprehensive best practices equipment preventative maintenance program that provides in-house resources and/or contractual services to deliver post warranty maintenance.

Documentation

q Document ongoing operations over the performance period of a best practices equipment maintenance program including documentation of in-house resources and/or contractual services to deliver post warranty maintenance.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Establish over the performance period a comprehensive best practices equipment preventative maintenance program. Utilize either in-house resources and/or contractual services to deliver post warranty equipment maintenance.

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1 point

IO Credit 1.3

Building Operations & Maintenance: **Building Systems Monitoring**

Intent

Support appropriate operations and maintenance of buildings and building systems to ensure they deliver target building performance goals over the life of the building.

Health Issues

Ongoing operations and maintenance procedures are inextricably linked to occupant health and safety. Monitoring O&M practices for consistency with original design intent and facility environmental/health policies helps to ensure that indoor air quality and mechanical performance standards are maintained.

Credit Goals

- Have in place over the performance period a system for continuous tracking and optimization of systems that regulate indoor comfort and the conditions (temperature, humidity, and CO_2) delivered in occupied spaces. The system must include:
  - Continuous monitoring of system equipment performance and of the indoor environmental conditions delivered in the building;
  - Alarms for performance or conditions that require repair;
  - A system in place that delivers prompt repairs to problems identified.

Documentation

❑ System Description

- Compile a narrative of the systems employed to continuously monitor equipment function and space conditions. The narrative must describe how these systems are used to identify and resolve equipment problems and to continuously deliver indoor comfort and the conditions delivered in occupied spaces.
- List of system equipment for which performance and the number of points are monitored.
- List of the indoor environmental conditions parameters monitored and the number of points monitored for each.
- List of settings for alarms.
- Description of system in place for delivering prompt repairs to problems identified.

❑ Performance over the performance period

- Document alarms that occurred.
- Document percent of time desired conditions are delivered in the building on a floor area weighted basis.

Reference Standards

There is no reference standard for this credit.

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IO Credit 1.3 continued

Building Operations & Maintenance: **Building Systems Monitoring**

Potential Technologies & Strategies

Use of automated systems to monitor equipment function and indoor space conditions provides the opportunity to identify system problems automatically and issue an alarm that initiates procedures to fix the problems identified.

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1 point

IO Credit 2.1

IAQ Management: Maintaining Indoor Air Quality

Intent

Enhance Indoor Air Quality (IAQ) performance by optimizing practices to prevent the development of indoor air quality problems in buildings.

Health Issues

The EPA estimates that indoor air pollution is one of the top five environmental risks to public health and as much as 10 times more polluted than outside air. Indoor air pollutants can cause problems ranging from immediate acute effects such as eye, nose, and throat irritation; sinusitis, asthma attacks, headaches; loss of coordination; and nausea; to long range chronic damage to the lungs, liver, kidney, and central nervous system and cancer. Building materials and the products used to install, clean and maintain them can be significant sources of a wide range of VOCs and other indoor air pollutants. Coupling properly designed, operated and maintained mechanical equipment with low-emitting materials can ensure healthy indoor air.

Credit Goals

- Establish an IAQ Compliance Program, as outlined in “A Guide to Managing Indoor Air Quality in Health Care Organizations”, Joint Commission on Accreditation of Healthcare Organizations, 1997.

OR

- Develop and implement on an ongoing basis an IAQ management program based on the U.S. EPA document "Building Air Quality: A Guide for Building Owners and Facility Managers".

Documentation

q Compile an IAQ Compliance Program or checklist for the facility.

Reference Standards

“A Guide to Managing Indoor Air Quality in Health Care Organizations”, Joint Commission on Accreditation of Healthcare Organizations, 1997.

U.S. EPA “Building Air Quality: A Guide for Building Owners and Facility Managers", Document No. 402-F-91-102, December 1991. www.epa.gov/iaq/largebldgs/graphics/iaq.pdf

Potential Technologies & Strategies

Establish and implement a program to enhance IAQ performance by optimizing practices to prevent the development of indoor air quality problems on an ongoing basis, thereby enhancing the well being of the building occupants. Survey building and evaluate systems to identify potential IAQ problems. Include in the program a plan for preventing moisture accumulation and mold in the building.

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IO Credit 2.1 continued

IAQ Management: **Maintaining Indoor Air Quality**

Establishing guiding principles for indoor air quality associated with operations and maintenance is important to ensure established thresholds are achieved and maintained during the life of the building. Procedures to monitor compliance with design intent should be standard practice. These strategies can be categorized by type and prioritized as follows:

- Ventilation (refer to Construction: EQ Credit 2 and Operations: IO Credit 3). Monitor mechanical ventilation air change rates required by health code standards, zoning areas where contaminants are generated.
- Building Materials (refer to Construction: EQ Credit 4). Significant sources of indoor air pollution are materials and products used in the building, such as cleaning compounds, adhesives, paints, carpeting, upholstery, manufactured wood products and other components of furniture, including medical furniture & equipment, each of which may emit volatile organic compounds (VOCs), including formaldehyde.
- Source Control (refer to Construction: EQ Credit 5 and Operations: ES Credits 1-4). Sources can include outdoor pollutants, indoor chemical use (including glutaraldehyde and other sterilizing agents and methylene chloride, used in adhesive removers, paint stripper, and aerosol spray paints.), cleaning products, fragrances and pesticides.
- Building Operations and Maintenance (refer to EQ Credit 5 and Operations).

Resources

I-Beam: The Future of IAQ in Buildings, United States Environmental Protection Agency; EPA 402-C-01-001, December 2002, IAQ Building Education and Assessment Model (I-Beam), http://www.epa.gov/iaq/largebldgs.

High Performance Building Guidelines, New York City DDC, 1999. http://www.nyc.gov/html/ddc/html/ddcgreen/reports.html

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1 point

IO Credit 2.2

IAQ Management: **Reduce Particulates in Air Distribution**

Intent

Reduce exposure of building occupants and maintenance personnel to potentially hazardous particulate contaminants.

Health Issues

The EPA estimates that indoor air pollution is one of the top five environmental risks to public health and as much as 10 times more polluted than outside air. Indoor air pollutants can cause problems ranging from immediate acute effects such as eye, nose, and throat irritation; sinusitis, asthma attacks, headaches; loss of coordination; and nausea; to long range chronic damage to the lungs, liver, kidney, and central nervous system and cancer. Building materials and the products used to install, clean and maintain them can be significant sources of a wide range of VOCs and other indoor air pollutants. Coupling properly designed, operated and maintained mechanical equipment with low-emitting materials can ensure healthy indoor air.

Credit Goals

- Have filters with particulate removal effectiveness of MERV 13 or greater in place over the performance period for all outside air intakes and for the returns for the re-circulation of inside air. Establish and follow a regular schedule for maintenance and replacement of these filters.

Documentation

q Verify that the building has had filters in place over the performance period with particulate removal effectiveness of MERV 13 or greater for all outside air intakes and for the returns for the re-circulation of inside air.

q Verify that a regular schedule for maintenance and replacement of these filters has been established and followed over the performance period.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Install and maintain in place filters with particulate removal effectiveness of MERV 13 or greater for all outside air intakes and for the returns for the re-circulation of inside air. Establish and follow a regular schedule for maintenance and replacement of these filters.

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Transportation Operations

1 point **TO Credit 1.1**

Alternative Transportation**: Public Transportation Access**

Intent

Reduce pollution and land development impacts from single occupancy vehicle use.

Health Issues

Motor vehicles represent the largest single source of atmospheric pollution including nitrogen oxides (a precursor of smog); benzene (a carcinogen); particulate matter (a trigger of respiratory illness and symptoms); volatile organic compounds (some of which are potentially hazardous and a precursor of smog); carbon dioxide (a greenhouse gas and a trigger for global climate change); and carbon monoxide (a probable human carcinogen).

Credit Goals

- Provide and maintain a building occupant conveyance program (shuttle-link) for buildings that are more than 1/2 mile from commuter rail or subway and 1/4 mile from established bus routes.

Documentation

q Retain records and results of quarterly contracts with shuttle-link service providers to determine if service continues to be provided within specified distances from building.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Perform a transportation survey of future building occupants to identify transportation needs. Establish shuttle services to encourage use of mass transit options by staff, visitors and other building occupants.

1 point **TO Credit 1.2**

Alternative Transportation: **Low Emitting & Fuel Efficient Vehicles**

Intent

Reduce pollution and land development impacts associated with single occupancy vehicle use.

Health Issues

Health care facilities often utilize fleets of vehicles for the purposes of maintaining and operating their facilities. These vehicles range from ambulances to delivery vans to shuttle buses, which often operate continuously and relatively locally. Motor vehicles represent the largest single source of atmospheric pollution including nitrogen oxides (a precursor of smog); benzene (a carcinogen); particulate matter (a trigger of respiratory illness and symptoms); volatile organic compounds (some of which are potentially hazardous and a precursor of smog); carbon dioxide (a greenhouse gas and a trigger for global climate change); and carbon monoxide (a probable human carcinogen). By reducing emissions, alternative fuel fleets contribute to healthier air quality, benefiting the health of the building occupants and the surrounding community.

Credit Goals

- Own or lease an alternative fuel vehicle fleet, using any combination of the acceptable fuel types, and comprising a minimum of 50% of total fleet mileage driven annually. Provide fueling stations for 100% of alternative fuel fleet, and preferred parking for such fleets, as applicable. Acceptable fuel types include bio-diesel, low-sulfur diesel, hydrogen, compressed natural gas, hybrid or all-electric.

Documentation

q Document proof of ownership of, or 2 year lease agreement for, hybrid or alternative fuel vehicles and calculations indicating that the vehicles will comprise 50% of hospital operated vehicle fleet, in terms of miles driven per year. Prepare site drawings showing preferred parking for those fleets.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Provide transportation amenities such as alternative fuel vehicle fleets to provide on-campus transportation or between-campus transportation, transportation to remote parking and staff housing, ambulance and ambulette fleets, refueling stations and carpool/vanpool programs.

Low sulfur diesel fuel and biodiesel are becoming available in many markets nationwide, particularly in regions designated as non-attainment areas or where there are high levels of ground level ozone. Low sulfur diesel fuels can be used in all diesel engines without modifications. Biodiesel is usable in most diesel engines as well, although in some older engines may require changing of rubber gaskets and more frequent changing of filters during initial use as it cleans the system. Note that use of biodiesel may affect warranty coverage.

1 point

TO Credit 1.3

Alternative Transportation: **Car Pool Programs**

Intent

Reduce pollution and land development impacts associated with automobile use.

Health Issues

Motor vehicles represent the largest single source of atmospheric pollution including nitrogen oxides (a precursor of smog); benzene (a carcinogen); particulate matter (a trigger of respiratory illness and symptoms); volatile organic compounds (some of which are potentially hazardous and a precursor of smog; carbon dioxide (a greenhouse gas and trigger for global climate change); and carbon monoxide (a probable human carcinogen).

Credit Goals

- Provide and maintain a building occupant car pooling program that serves a minimum of 5% of the full time equivalent (FTE) peak period staff and add no new parking. Provide preferred parking for car pool participants.

Documentation

q Maintain records of car pool participants and document participation by 5% of the FTE peak period staff.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Perform a transportation survey of future building occupants to identify transportation needs. Establish car pool program to assist staff in organizing efficient car pool partners.

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Energy Efficiency

Required **EE Prerequisite 1**

Existing Building Commissioning

Intent

Verify that fundamental building systems and assemblies are performing as intended to meet current needs and sustainability requirements.

Health Issues

Energy efficiency benefits health by reducing particulate, chemical and greenhouse gas emissions associated with fossil-fuel based combustion and electrical generation, thereby improving outdoor air quality and curbing global warming potential.

Credit Goals

- Verify and ensure that fundamental building elements and systems are installed, calibrated, and operating as intended so they can deliver functional and efficient performance.
    - Carry out a comprehensive existing building commissioning including the following procedures:
    - Develop a comprehensive building operation plan that meets the requirements of current building usage, and addresses the heating system, cooling system, humidity control system, lighting system, safety systems and the building automation controls.
    - Prepare a commissioning plan for carrying out the testing of all building systems to verify that they are working according to the specifications of the building operation plan.
    - Implement the commissioning plan documenting all the results.
    - Repair or upgrade all systems' components that are found to not be working according to the specifications of the building operation plan.
    - Re-test all building components that required repairs or upgrades to verify that they are working according to the specifications of the building operation plan.

OR

- Submit a 1-5 year plan for continuous improvement of these aspects of commissioning requirements 1-6 until all aspects are completed. During the implementation of the continuous improvement plan, demonstrate continuous improvement on a yearly basis until all aspects are completed. All low cost and no cost measures must be implemented in the first 2 years of the implementation program.

Documentation

q Compile a narrative summary of the current building operation plan that highlights major building systems and assemblies.

q Verify that all 6 actions in the Credit Goals have been completed.

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EE Prerequisite 1 continued

Existing Building Commissioning

OR

- **q** If one or more aspects of the 6 actions in the Credit Goals have not been completed, prepare a 5 Year Plan that includes a schedule of annual actions that will be implemented in order to complete all 6 actions in the Credit Goals within 5 years.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

The commissioning process activities begin by identifying the current building operating intents (Owner's Operational Requirements) and then proactively making sure that the buildings' systems are operating as necessary to meet these operating intents.

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Required

EE Prerequisite 2

Minimum Energy Performance

Intent

Establish the minimum level of energy performance for the building and systems.

Health Issues

Energy efficiency benefits health by reducing particulate, chemical and greenhouse gas emissions associated with fossil-fuel based combustion and electrical generation, thereby improving outdoor air quality and curbing global warming potential.

This prerequisite has been defined to require a building baseline computation that recognizes regulatory context and that is based upon actual ongoing building performance as a basis for defining performance improvement.

Credit Goals

- Demonstrate that the building has achieved an EPA ENERGY STAR® score of at least 60 utilizing the EPA ENERGY STAR Benchmarking Tool for building types addressed by ENERGY STAR,

Documentation

q If the building type is addressed by ENERGY STAR® (such as acute care hospitals and medical office buildings), compile benchmarking tool output documenting that the building energy has achieved an EPA ENERGY STAR score of at least 60.

q Compile a summary of the annual energy bills, including cost and usage amounts (kilowatt-hours, therms, gallons, etc.), for each type of energy used by the building.

q Review copies of the most recent 12 months of building energy bills.

Reference Standards

EPA's ENERGY STAR National Energy Performance Rating System, www.energystar.gov/benchmark.

Potential Technologies & Strategies

Retrofit building systems to improve energy performance while maintaining or improving health and safety requirements. Consider the following strategies as are regionally and climatically appropriate:

- Building envelope improvements to reduce energy requirements, including, for example, insulation, window and door replacements.
- Energy (latent and sensible) recovery.
- round source heat pumps.

EE Prerequisite 2 continued

Minimum Energy Performance

- Evaporative cooling when ambient conditions allow.
- Reduce outside airflow during unoccupied periods.
- Expand unoccupied temperature dead band by automatically resetting zone temperature set points based on occupancy.
- Separate HVAC zones with constant airflow, temperature and humidity control requirements from those with single or double shift occupancy that would allow reductions in air changes or setbacks in temperature and humidity. Provide a cooling system with at least two cooling loops operated at different temperatures. This can be accomplished with separate chillers (or direct tower cooling).
- Design for high partial-load heating and cooling efficiency.
- Integrate daylighting strategies to decrease building energy demand.
- Design high efficiency chiller plants that use various technologies and strategies to reduce overall plant energy consumption at full and partial loads (such as chillers with variable speed drives on the compressors, primary-only variable flow pumping, series-counterflow chiller arrangements, etc.).
- Use low leakage air handling units to reduce overall fan horsepower while ensuring that air is properly filtered.
- Retrofit high efficiency lighting, variable speed motors, and Energy Star-rated equipment to reduce electrical consumption.

Required

EE Prerequisite 3

Ozone Protection

Intent

Reduce ozone depletion.

Health Issues

Stratospheric ozone layer depletion increases exposure to ultraviolet radiation, increasing risk factors for skin cancer and immune system depression. The United States is one of the world's largest emitters of ozone depleting substances. As part of the U.S. commitment to implementing the Montreal Protocol, the EPA has implemented regulations relative to the responsible management of CFCs, including programs to end the production of ozone depleting substances.

Credit Goals

- Zero use of CFC-based refrigerants in HVAC&R base building systems unless a third party audit shows that system replacement or conversion is not economically feasible.
  - Definition of required economic analysis: The replacement of a chiller will be considered to be not economically feasible if the simple payback of the replacement is greater than 10 years. To determine the simple payback, divide the cost of implementing the replacement by the annual cost avoidance for energy that results from the replacement and any difference in maintenance costs. If CFC-based refrigerants are maintained in the building, reduce annual leakage to 5% or less using EPA Clean Air Act, Title VI, Rule 608 procedures governing refrigerant management and reporting, and reduce the total leakage over the remaining life of the unit to less than 30% of its refrigerant charge.

Documentation

- q Document that base building HVAC&R systems do not use CFCs.

OR

- q Document results of third-party audit demonstrating that replacement is not economically feasible.
- q Document compliance with EPA Clean Air Act, Title VI, Rule 608 governing refrigerant management and reporting.
- q Document that the annual refrigerant leakage rate is below 5% and the leakage over the remainder of unit life is being maintained below 30%.

Reference Standards

EPA Clean Air Act, Title VI, Rule 608 governing refrigerant management and reporting.

Potential Technologies & Strategies

Set up leakage minimization procedures and systems to meet annual leakage minimization standards and reporting requirements.

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1-10 points **EE Credit 1**

Optimize Energy Performance

Intent

Achieve increasing levels of energy efficiency to reduce environmental and health burdens associated with excessive energy use.

Health Issues

Energy efficiency can enhance human health by reducing particulate, chemical and greenhouse gas emissions associated with fossil-fuel based combustion and electrical generation, thereby improving outdoor air quality and curbing global warming potential.

Credit Goals

- Demonstrate the EPA ENERGY STAR® score that the building has achieved. Utilize the EPA ENERGY STAR Benchmarking Tool for building types addressed by ENERGY STAR.

Credit 1.1 (1 point)	Energy Star score of 63
Credit 1.2 (2 points)	Energy Star score of 67
Credit 1.3 (3 points)	Energy Star score of 71
Credit 1.4 (4 points)	Energy Star score of 75
Credit 1.5 (5 points)	Energy Star score of 79
Credit 1.6 (6 points)	Energy Star score of 83
Credit 1.7 (7points)	Energy Star score of 87
Credit 1.8 (8 points)	Energy Star score of 91
Credit 1.9 (9 points)	Energy Star score of 95
Credit 1.10 (10 points)	Energy Star score of 99

Documentation

q Compile a summary of the annual bills, including cost and usage amounts (kilowatt-hours, therms, gallons, etc.), for each type of energy used by the building annually over the performance period.

q Review copies of the most recent 12 months of building utility bills including both energy use and peak demand, if available.

AND

q If the building type is addressed by EPA's ENERGY STAR®, such as for acute care hospitals and medical office buildings, compile benchmarking tool output documenting the building EPA ENERGY STAR scores over the performance period.

EE Credit 1 continued

Optimize Energy Performance

Reference Standards

EPA's ENERGY STAR® National Energy Performance Rating System, www.energystar.gov/benchmark.

Potential Technologies & Strategies

Implement energy-efficiency retrofits and energy-saving techniques to reduce energy use to the level required to earn this credit.

Retrofit building systems to improve energy performance while maintaining or improving health and safety requirements. Consider the following strategies as are regionally and climatically appropriate:

- Building envelope improvements to reduce energy requirements, including insulation, window and door replacements, and the like.
- Energy (latent and sensible) recovery.
- Ground source heat pumps.
- Evaporative cooling when ambient conditions allow.
- Reduce outside airflow during unoccupied periods.
- Expand unoccupied temperature dead band by automatically resetting zone temperature set points based on occupancy.
- Separate HVAC zones with constant airflow, temperature and humidity control requirements from those with single or double shift occupancy that would allow reductions in air changes or setbacks in temperature and humidity.
- Provide a cooling system with at least two cooling loops operated at different temperatures. This can be accomplished with separate chillers (or direct tower cooling).
- Design for high part-load heating and cooling efficiency.
- Daylighting decreases energy costs for buildings by providing natural solar lighting.
- Design high efficiency chiller plants that use various technologies and strategies to reduce overall plant energy consumption at full and part loads (such as chillers with variable speed drives on the compressors, primary-only variable flow pumping, series-counterflow chiller arrangements, etc.).
- Use low leakage air handling units to reduce overall fan horsepower while ensuring that air is properly filtered.
- Retrofit high efficiency lighting, variable speed motors, and Energy Star® rated equipment to reduce electrical consumption.

1-4 points

EE Credit 2

On-Site and Off-Site Renewable Energy

Intent

Encourage and recognize increasing levels of on-site and off-site renewable energy in order to reduce environmental and health burdens associated with fossil fuel energy use.

Health Issues

Energy generated from environmentally sensitive renewable energy resources reduces the particulate, chemical and greenhouse gas emissions associated with fossil-fuel generated electricity, thereby improving outdoor air quality and curbing global warming potential.

Credit Goals

- Over the performance period, fulfill some or all of the building's total energy use through the use of on-site or off-site renewable energy systems. Points are earned according to the following table. The percentages shown in the table are the percentage of building energy use over the performance period met by renewable energy resources.

- Off-site renewable energy sources are as defined by the Center for Resource Solutions (CRS) Green-e products certification requirements or the equivalent. Green power may be procured from a Green-e certified power marketer, a Green-e accredited utility program, or through Green-e certified Tradable Renewable Certificates or the equivalent. At least 25% of any off-site green power or Green Certificates used to earn this credit needs to be from new sources (sources constructed after 1997). For on-site renewable energy that is claimed for this credit, the associated environmental attributes must be retained or retired and cannot be sold.

- Up to the four-point limit, any combination of individual actions will be awarded the sum of the points allocated to those individual actions. For example, one point would be awarded for implementing 1% of on-site renewable energy. Two additional points would be awarded for meeting 10% of the building's electrical load with renewable power or certificates over the performance period.

Total Points	On-site Renewable Energy		Off-site Renewable Energy Certificates
1	1%	OR	5%
2	2%	OR	10%
3	5%	OR	25%
4	10%	OR	50%

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EE Credit 2 continued

On-Site and Off-Site Renewable Energy

Documentation

- Compile system schematic diagrams and narrative highlighting on-site renewable energy systems installed in the building.
- Meter energy output of on-site renewable energy system over the performance period to determine compliance with the requirements.
- Compile calculations documenting the percentage of the building's total energy requirements that was supplied by on-site renewable energy systems for the performance period.

OR

- Calculate the percentage of the building's electrical load that was met with renewable power or certificates over the performance period.
- Compile documentation demonstrating that the supplied renewable power or certificates over the performance period met the referenced Green-e requirements or the equivalent.
- Confirm a commitment to continue purchases of renewable power or certificates at the same or higher level over the next performance period.

Reference Standards

Center for Resource Solutions Green-e Products Certification Requirements. Center for Resource Solutions, www.green-e.org.

Potential Technologies & Strategies

Design and specify the use of on-site nonpolluting renewable technologies to contribute to the total energy requirements of the project. Consider and employ solar, geothermal, wind, biomass (other than unsustainably harvested wood) and biogas technologies.

Purchase renewable energy or renewable energy tradable certificates to meet some or all of the building's energy requirements. Review historic building electrical consumption trends. Research power providers in the area and select a provider that guarantees that a fraction of its delivered electric power is derived from net nonpolluting renewable technologies. If the project is in an open market state, investigate green power and power marketers licensed to provide power in that state. Grid power that qualifies for this credit originates from solar, wind, geothermal, biomass or low-impact hydro sources.

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1 point **EE Credit 3**

Energy Efficient Equipment

Intent

Reduce energy consumption by using energy-efficient medical and other equipment.

Health Issues

Energy efficiency benefits health by reducing particulate, chemical and greenhouse gas emissions associated with fossil-fuel based electrical generation, thereby improving outdoor air quality and curbing global warming potential.

Credit Goals

- Obtain and install a minimum 75%, based on cost, of the annual electrical medical and office equipment, that is either Energy Star® qualified, or in the top 25th percentile for energy consumption for that class of equipment.

Documentation

- q Compile a listing of all medical and office equipment purchased and calculations demonstrating that the threshold percentage of Energy Star-qualified products is achieved.
- q Where Energy Star-qualified equipment is not yet available for an application, demonstrate reasonable effort to meet the 25th percentile criterion by identifying a minimum of three other equivalent models that meet the functional needs of the facility with higher energy consumption requirements. If there are less than three other functionally equivalent models available on the market, use the most efficient available.

Reference Standards

EPA Energy Star® Program at www.energystar.gov.

Potential Technologies & Strategies

Purchase computers, related electronics, and office equipment that carry the Energy Star® label. Examples of these include:

- Computers and Monitors
- Copiers
- DVD Products
- Printers
- Refrigerators
- Scanners
- TVs & VCRs
- Water Coolers
- Commercial Solid Door Refrigerators and Freezers

EE Credit 3 continued

Energy Efficient Equipment

This is just a sampling of a steadily increasing list. Refer to EPA's Energy Star® Program at www.energystar.gov for an up to date list of product categories and models: http://www.energystar.gov/index.cfm?fuseaction=find_a_product.

Investigate availability of Energy Star® qualified products for medical equipment purchases, particularly those items that are purchased or leased in quantity or represent particularly high electric consumption. Do market survey for best 25 percent equipment where equipment is not yet available with Energy Star® labeling. Examples of priority high load medical equipment to focus on include:

- Diagnostic imaging equipment (x-rays, MRIs, etc)
- Sterilization
- Physiological monitoring
- Laundry
- Dietary

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1 point

EE Credit 4

Refrigerant Selection

Intent

Reduce ozone depletion and support early compliance with the Montreal Protocol.

Health Issues

Stratospheric ozone layer depletion leads to increased exposure to ultraviolet radiation, increasing risk factors for skin cancer and immune system depression. The United States is one of the world's largest emitters of ozone depleting substances. As part of the US commitment to implementing the Montreal Protocol, the EPA has implemented regulations relative to the responsible management of CFCs, including programs to end the production of ozone depleting substances.

Credit Goals

- Do not operate base building HVAC, refrigeration or fire suppression systems that contain HCFCs or Halons.

OR

- Reduce emissions of refrigerants from base cooling equipment to less than 3% of charge per year over the performance period using EPA Clean Air Act, Title VI, Rule 608 procedures governing refrigerant management and reporting and reduce the leakage over the remainder of unit life to below 25%.

Documentation

q Document that base building HVAC&R systems do not use HCFCs or Halons.

OR

q Document that emissions of refrigerants from base cooling equipment over the performance period are less than 3% of charge per year using EPA Clean Air Act, Title VI, Rule 608 procedures governing refrigerant management and reporting.

q Verify that leakage over the remainder of unit life is being maintained below 25%.

Reference Standards

EPA Clean Air Act, Title VI, Rule 608 governing refrigerant management and reporting.

Potential Technologies & Strategies

Set up loss minimization procedures and systems to meet annual loss minimization standards and reporting requirements.

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1-2 points

EE Credit 5.1

Performance Measurement: **Enhanced Metering**

Intent

Demonstrate ongoing accountability and optimization of building energy and water consumption performance over time and add incentives for additional energy reduction.

Health Issues

Energy efficiency can enhance human health by reducing particulate, chemical and greenhouse gas emissions associated with fossil-fuel based combustion and electrical generation, thereby improving outdoor air quality and curbing global warming potential.

Credit Goals

- Have in place over the performance period continuous metering for the following items: (Up to 2 points can be earned - one point is earned for each 4 actions implemented/maintained). For each item metered, prepare, implement and maintain a program for using the data gathered to improve building performance over time.
  - Lighting systems and controls.
  - Separate building electric meters that allow aggregation of all process electric loads.
  - Separate building natural gas meters that allow aggregation of all process natural gas loads.
  - Chilled water system efficiency at variable loads (kW/ton) or cooling loads (for non-chilled water systems).
  - Cooling load.
  - Air and water economizer and heat recovery cycle operation.
  - Boiler efficiencies.
  - Building specific process energy systems and equipment efficiency.
  - Constant and variable motor loads.
  - Variable frequency drive (VFD) operation.
  - Air distribution, static pressure and ventilation air volumes.

Documentation

q For each item metered prepare a description of the performance improvement program implemented using the data gathered to improve system/building performance over time.

q Prepare quarterly reports on the metered data gathered and for each item metered a report card of its performance. Document one day of actual output of all data recorded.

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EE Credit 5.1 continued

Performance Measurement: **Enhanced Metering**

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Have in place over the performance period continuous metering for the identified categories of energy and system performance. For each item metered, prepare, implement and maintain a program for using the data gathered to improve building performance over time. IPMVP Volume I: Concepts and Options for Determining Energy Savings can be used to track energy savings of specific energy efficiency measures implemented in buildings.

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1 point

EE Credit 5.2

Performance Measurement: **Emission Reduction Reporting**

Intent

Reduce building energy use and associated emissions.

Health Issues

Energy efficiency can enhance human health by reducing particulate, chemical and greenhouse gas emissions associated with fossil-fuel based combustion and electrical generation, thereby improving outdoor air quality and curbing global warming potential.

Credit Goals

- Identify building performance parameters that reduce energy use and reduce emissions.
  - Track and record the significant emission reductions including those delivered by energy efficiency, renewable energy and other building emission reduction actions including: carbon dioxide (CO2), sulfur dioxide (SO2), nitrogen oxides (NOx), mercury (Hg), small particulates (PM2.5), large particulates (PM10), and volatile organic compounds (VOCs).
  - Report the reductions in emissions resulting from these energy efficiency and renewable operations using a third party voluntary certification program.
  - Retire at least 10% of the emission reductions, delivered by the energy efficiency actions through a third party voluntary certification program. (To meet this requirement the third party voluntary emission reduction certification and emission reduction retirement programs must be programs of credible organizations. Third party programs shall notify any applicable local or regional emission reduction registries of the reported emission reductions.)
  - Ask the suppliers of good and services for the building to do the same by implementing actions above.

Documentation

q Compile reporting of all building performance parameters that reduce energy use and calculate the total savings for each type of energy reduction. Compile reporting of renewable energy use and other emission reduction actions.

q Calculate and compile a reporting of the resulting reductions for the significant types of environmental emissions resulting from the energy efficiency operations and other emission reduction actions using the emission reduction calculation protocol of a third party voluntary certification program. Emission reductions to be tracked include: carbon dioxide (CO2), sulfur dioxide (SO2), nitrogen oxides (NOx), mercury (Hg), small particulates (PM2.5), large particulates (PM10), and volatile organic compounds (VOCs).

q Document the retirement of at least 10% of the emission reductions, delivered by the energy efficiency measures, renewable energy and other emission reduction actions, through a third party voluntary certification program.

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EE Credit 5.2 continued

Performance Measurement: **Emission Reduction Reporting**

- Ensure that the suppliers for fossil fuels have been asked to report energy savings, renewable energy use and other emission reduction actions. Report all types of resulting emissions reductions and retire at least 10% of these reductions through a third party voluntary certification program and ask their suppliers of goods and services to do the same.

- Ensure that a third party voluntary certification program has notified any applicable local or regional emission reduction registries of the reported emission reductions.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Addressing all the significant pollutants for which reductions can be achieved through energy efficiency, renewable energy and other emission reduction activities is important because of the associated environmental and health effects specifically: carbon dioxide ($CO2$), sulfur dioxide ($SO2$), nitrogen oxides (NOx), mercury (Hg), small particulates (PM2.5), large particulates (PM10), and volatile organic compounds (VOCs). Moreover, energy efficient strategies can be achieved at a low cost yielding significant emission reductions.

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Water Conservation

Required **WC Prerequisite 1**

Minimum Water Efficiency

Intent

Maximize fixture water efficiency within buildings to reduce the burden on potable water supply and wastewater systems.

Health Issues

Maintaining adequate potable water supplies is a basic necessity for the health of individuals and communities. Only about 1% of the water on Earth is freshwater. Processing potable water is energy intensive and thus contributes to air emissions associated with fossil fuel energy generation (for the treatment, pumping and maintenance of the potable water systems). Only about 20% of current urban water is used for drinking and sanitary purposes, with the other 80% not requiring treatment to potable standards. Using reclaimed water for selected applications can reduce costs and preserve precious potable water supplies. To protect the public health, a dual or dedicated distribution system must be installed to segregate potable and reclaimed water for health, product and process purposes.

Credit Goals

- Maximize fixture potable water efficiency to achieve a level equal to or below water use baseline, calculated as 120 percent of the water usage that would result if 100% of the total building fixture count were outfitted with plumbing fixtures that meet the Energy Policy Act of 1992 fixture performance requirements. If the building does not have separate metering for each water use (fixture use, process use, irrigation and other uses) the water use reduction achievements can be demonstrated with calculations. At least one meter for the overall building water use is required and metering for cooling towers and other process water uses are encouraged but not required.

Documentation

q Document that the existing building fixture potable water use is equal to or less than a baseline calculated as 120% of the water usage that would result if 100% of the total building fixture count were outfitted with plumbing fixtures that meet the Energy Policy Act of 1992 fixture performance requirements.

q Obtain quarterly and annual water meter data for the performance period for potable water use inside the building showing that the annual fixture potable water use is equal to or less than the calculated baseline.

q Calculate fixture potable water use per occupant and per square foot.

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WC Prerequisite 1 continued

Minimum Water Efficiency

Reference Standards

The Energy Policy Act (EPACT) of 1992, http://tis.eh.doe.gov/nepa.

Potential Technologies & Strategies

Reduce fixture potable water usage through automatic water control systems. Install, where possible, water conserving plumbing fixtures that meet or exceed Energy Policy Act of 1992 fixture requirements in combination with ultra high efficiency or dry fixture and control technologies.

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1-2 points

WC Credit 1

Water Use Reduction: **Water Efficient Landscaping**

Intent

Provide for the ongoing optimization and conservation of building potable water consumption over time and in areas of the facility not otherwise impacted by construction.

Health Issues

Maintaining adequate potable water supplies is a basic necessity for the health of individuals and communities. Only about 1% of the water on Earth is freshwater. Processing potable water is energy intensive and thus contributes to air emissions associated with fossil fuel energy generation (for the treatment, pumping and maintenance of the potable water systems). Only about 20% of current urban water is used for drinking and sanitary purposes, with the other 80% not requiring treatment to potable standards. Using reclaimed water for selected applications can reduce costs and preserve precious potable water supplies. Eliminating potable water for irrigation systems is an important conservation strategy.

Credit Goals

- Use high-efficiency irrigation technology OR use captured rain or recycled site water to reduce potable water consumption for irrigation in comparison to conventional means of irrigation. Achieve reductions in potable water use for irrigation over conventional means of irrigation.

Credit 1.1 (1 point)	Adopt technologies and strategies to reduce potable water use for irrigation by 50%. Document the reductions from baseline.
Credit 1.2 (1 point)	Adopt technologies and strategies to reduce potable water use for irrigation by 100%. Document the reductions from baseline (additive to Credit 1.1).

- If the building does not have separate metering for each water use (fixture use, process use, irrigation and other uses) the water use reduction achievements can be demonstrated with calculations. At least one meter for the overall building water use is required (see WC Prerequisite 1). In urban settings, where there is no lawn, credits can be earned by reducing the use of potable water for watering any roof/courtyard garden space or outdoor planters.

Documentation

q Compile a brief narrative description, system schematics, photographs and calculations demonstrating how much potable water use for irrigation is reduced in comparison to conventional means of irrigation.

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WC Credit 1 continued

Water Use Reduction: **Water Efficient Landscaping**

- Describe the type of irrigation system that is "conventional" in the area and the extent that the "conventional" type of irrigation system is used in the area.

- The head of facility management for the facility is required to sign off on the calculation of reduction in the amount of potable water used for irrigation.

- Compile quarterly water meter readings over the performance period supporting the documentation of the reduction in potable water use for irrigation as well as quarterly reports over the performance period that document the maintenance activities implemented to ensure proper operation of the irrigation system.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Specify water-efficient, native or adapted, climate tolerant plantings. Implement or maintain high efficiency irrigation technologies that include micro irrigation, moisture sensors, or weather data based controllers. Feed irrigation systems with captured rainwater, gray water (site or municipal), or on-site treated wastewater. Consider eliminating use of an irrigation system. Consider use of xeriscaping principles, particularly though not exclusively in dry/arid climates.

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1-2 points

WC Credit 2

Building Water Use Reduction

Intent

Maximize fixture water efficiency within buildings to reduce the burden on potable water supply and wastewater systems.

Health Issues

Maintaining adequate potable water supplies is a basic necessity for the health of individuals and communities. Only about 1% of the water on Earth is freshwater. Processing potable water is energy intensive and thus contributes to air emissions associated with fossil fuel energy generation (for the treatment, pumping and maintenance of the potable water systems). Only about 20% of current urban water is used for drinking and sanitary purposes, with the other 80% not requiring treatment to potable standards. Using reclaimed water for selected applications can reduce costs and preserve precious potable water supplies. To protect the public health, a dual or dedicated distribution system must be installed to segregate potable and reclaimed water for health, product and process purposes.

Credit Goals

- Have in place over the performance period strategies and systems that in aggregate produce a reduction of fixture potable water use from the calculated fixture water usage baseline established in WC Prerequisite 1. If the building does not have separate metering for each water use (fixture use, process use, irrigation and other uses) the water use reduction achievements can be demonstrated with calculations. At least one meter for the overall building water use is required and metering for cooling towers and other process water use encouraged but not required.

Credit 2.1 (1 point)	Adopt technologies and strategies to reduce fixture water use by 10%. Document the reductions from baseline.
Credit 2.2 (1 point)	Adopt technologies and strategies to reduce fixture water use by 20%. Document the reductions from baseline (additive to Credit 2.1).

Documentation

q Verify (calculations, fixture cut sheets, results of direct measurement and photographs) that the existing building fixture potable water use over the performance period is less than the baseline established in WC Prerequisite 1.

q Compile quarterly and annual water meter data for water use in the building supporting the documentation of the annual fixture potable water use over the performance period.

WC Credit 2 continued

Building Water Use Reduction

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Reduce fixture water usage through automatic controls and other actions. Specify water conserving plumbing fixtures that exceed Energy Policy Act of 1992 fixture requirements in combination with ultra high efficiency or dry fixture and control technologies.

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1-3 points

WC Credit 3

Process Water Efficiency

Intent

Reduce process potable water use and process wastewater generation.

Health Issues

Maintaining adequate potable water supplies is a basic necessity for the health of individuals and communities. Only about 1% of the water on Earth is freshwater. Processing potable water is energy intensive and thus contributes to air emissions associated with fossil fuel energy generation (for the treatment, pumping and maintenance of the potable water systems). Only about 20% of current urban water is used for drinking and sanitary purposes, with the other 80% not requiring treatment to potable standards. Using reclaimed water for selected applications can reduce costs and preserve precious potable water supplies. To protect the public health, a dual or dedicated distribution system must be installed to segregate potable and reclaimed water for health, product and process purposes.

Approximately 70% of the potable water consumption in health care facilities is attributable to process water uses, compared to less than 30% consumed for "domestic" use. Reduction of potable water use for process water applications is an important component of water conservation measures in this sector.

Credit Goals

- Process water is defined as water used for non-sanitary purposes. Examples of process water use in a health care facility include imaging equipment, microscopes, decontamination equipment, other diagnostic and lab equipment, dietary equipment and laundry facilities.

Credit 3.1 (1 point)	Adopt technologies and strategies to reduce process water use and process wastewater generation by 20%. Document the reductions from baseline.
Credit 3.2 (1 point)	Adopt technologies and strategies to reduce process water use and process wastewater generation by 30%. Document the reductions from baseline. (additive to credit 3.1)
Credit 3.3 (1 point)	Adopt technologies and strategies to reduce process water use and process wastewater generation by 40%. Document the reductions from baseline. (additive to Credits 3.1 and 3.2)

Documentation

q Compile documentation establishing a baseline process water use budget, and the calculations indicating percentage reduction relative to baseline.

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WC Credit 3 continued

Process Water Efficiency

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Employ methodologies based on Pollution Prevention hierarchy – reduce, reuse, recycle. Treat process wastewater (boiler blowdown, for instance) or capture condensate from air conditioning cooling coils so that it can be downcycled for use in cooling towers, irrigation, etc. Reduce water used for wash-up by using efficient floor wash machines instead of hosing.

Consider water reduction strategies for high use processes such as food service and laundry. Some hospitals are implementing programs to reduce laundry volumes through more selective linen changes, resulting in savings of 20%- 30% of laundry water volumes.

1 point

WC Credit 4

Performance Measurement: **Enhanced Metering**

Intent

Provide for the ongoing optimization and conservation of potable water consumption over time and in areas of the facility not otherwise impacted by construction.

Health Issues

Maintaining adequate potable water supplies is a basic necessity for the health of individuals and communities. Only about 1% of the water on Earth is freshwater. Processing potable water is energy intensive and thus contributes to air emissions associated with fossil fuel energy generation (for the treatment, pumping and maintenance of the potable water systems). Only about 20% of current urban water is used for drinking and sanitary purposes, with the other 80% not requiring treatment to potable standards. Using reclaimed water for selected applications can reduce costs and preserve precious potable water supplies. To protect the public health, a dual or dedicated distribution system must be installed to segregate potable and reclaimed water for health, product and process purposes.

Credit Goals

- Employ strategies for long term continuous measurement of potable water uses within the facility. Install metering devices to measure potable water use, as applicable to the facility. One point is earned for installation in a minimum of 3 locations:
  - Water use in laboratory
  - Water use in dietary department
  - Water use in central sterile and processing department
  - Water use in laundry
  - Water use in radiology and imaging department
  - Water use in surgical suite
  - Purified water system (reverse osmosis and/or deionized) and filter backwash water
  - Outdoor irrigation systems
  - Cooling tower make-up and filter backwash water
  - Steam boiler system make-up water
  - Closed loop hydronic system make-up water
  - Water use in mechanical equipment, including pumps.

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WC Credit 4 continued

Performance Measurement: **Enhanced Metering**

Documentation

- Establish and implement a Measurement & Verification Plan.
- Include a summary schedule of the instrumentation and controls for the required monitoring categories, highlighting the input/output (I/O) data points to be collected.
- Document the monitoring system, including cut sheets of sensors and the data collection system.

Reference Standards

International Performance Measurement and Verification Protocol Volume 1, 2001 Version, http://www.ipmvp.org/.

Potential Technologies & Strategies

Install submeters to measure potable water systems in areas of the facility not included in construction project scope. Use measured system data to identify opportunities to reduce potable water use.

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Chemical Management

Required **CM Prerequisite 1**

Polychlorinated Biphenyl (PCB) Removal

Intent

Reduce the potential exposure of building occupants to PCBs and PCB combustion by-products in case of fire in the building.

Health Issues

The 209 chemicals classified as PCBs, are persistent, bioaccumulative, and toxic chemicals (PBTs). PCBs are associated with a variety of adverse health effects, including cancer and effects on the immune, reproductive, nervous, and endocrine systems. These can occur even with very low exposure levels. The 1996 U.S. EPA reassessment of PCBs determined that PCBs are probable human carcinogens; other agencies, including the International Agency for Research on Cancer, the National Toxicology Program, and the National Institute for Occupational Safety and Health, have reached similar conclusions.

Credit Goals

- Establish a PCB management program.
- Identify the applicable regulatory requirements.
- Have a current survey that identifies where PCBs are located in the building and on the site so that the PCBs present can be addressed appropriately in the ongoing PCB management program.

Documentation

- Verify that PCB-containing materials are not present in the building or on the site.

OR

- Compile the current PCB management program that identifies the applicable regulatory requirements and explains how the program is addressing PCBs remaining in the building on an ongoing basis.
- Review the past PCB work done on the building and on the building site and use these data to prepare the history-based component of the PCB survey for the building and the site, collecting the available information on: (1) where PCBs have been removed; (2) where PCBs remain; and (3) how the remaining PCBs are being addressed.
- Update the PCB survey for the building and the site with current information by: (1) sampling additional likely locations in building and on the site for PCBs; and (2) testing samples to see if PCBs are present.
- If the survey identifies any new locations with PCBs, add these to the description of how the PCB management program is addressing PCBs remaining in the building on an ongoing basis.

Reference Standards

There is no reference standard for this credit.

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CM Prerequisite 1 continued

Polychlorinated Biphenyl (PCB) Removal

Potential Technologies & Strategies

Review the current PCB management program, and prepare a description of the program that identifies the applicable regulatory requirements and explains how the program will address PCBs remaining in the building on an ongoing basis.

Review PCB work done in the building and on the building site and use these data to prepare the history-based component of the PCB survey by collecting the available information on: (1) where PCBs have been removed; (2) where PCBs remain; and (3) how the remaining PCBs are being addressed.

Update this survey with current information by: (1) sampling additional likely locations in the building and on the site for PCBs; and (2) testing samples to see if PCBs are present. If the survey identifies any new locations with PCBs, add these to the description of how the PCB management program is addressing PCBs remaining in the building on an ongoing basis.

1 point

CM Credit 1.1

Community Contaminant Prevention: **Airborne Releases**

Intent

Minimize building airborne effluents and environmental, health and safety burdens to site and neighbors.

Health Issues

Health care facilities often include laboratories, pharmacies, and diagnostic services that generate substances toxic to patients, staff, visitors, and neighboring communities. Minimizing or containing such emissions protects human health and the environment from exposure to these toxic substances.

Credit Goals

- Exceed by 10% the NIH-CDC Guidelines for Airborne Effluent from Laboratories that Handle Biohazards (CDC-NIH Biosafety in Microbiological and Biomedical Laboratories, latest edition (currently May 1999).
- Meet all standards of California South Coast Air Quality Management District for all products of combustion.
- Obtain low sulfur diesel or bio-diesel fuels for generators and other diesel equipment.

Documentation

q Verify from the mechanical engineer of record that the NIH-CDC Guidelines for Airborne Effluent from Laboratories that Handle Biohazards have been exceeded by 10% and all California South Coast Air Quality Management District standards for products of combustion have been met.

q Review purchasing records on diesel fuel purchases to verify purchase of low sulfur or bio-diesel fuel.

Reference Standards

National Institutes for Health -CDC Guidelines for Airborne Effluent from Laboratories that Handle Biohazards (CDC-NIH Biosafety in Microbiological and Biomedical Laboratories, latest edition (currently May 1999).

California South Coast Air Quality Management District, http://www.aqmd.gov.

Potential Technologies & Strategies

- Maintain scrubbers and filters for boilers and diesel generators.
- Test and recertify all filters annually.
- Burn fuels low in sulfur content. Provide air quality abatement equipment for equipment that burns fossil fuels.
- Burn bio-diesel fuels in lieu of fossil fuels.

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1 point

CM Credit 1.2

Community Contaminant Prevention**: Leaks & Spills**

Intent

Prevent releases of hazardous chemicals and fuels to storm sewer.

Health Issues

Health care facilities store and manage hazardous chemicals in underground tanks and other outdoor facilities, potentially risking contamination of aquifers and stormwater. By minimizing these risks, health care facilities can contribute to protecting the health of the surrounding community.

Credit Goals

- Develop and implement a policy to use containment and engineering controls to manage outdoor storage of fuels and chemicals in order to minimize risk from leakage and spills.

Documentation

q Compile outdoor chemical storage policy and procedures, a plan indicating the location of all storage facilities, and a narrative describing secondary containment provisions.

Reference Standards

Title 40, Code of Federal Regulations, Part 112 (for spill control and countermeasures).

Potential Technologies & Strategies

Develop a facility wide policy governing the controlled and secure outdoor storage of hazardous chemicals and fuels, both for incoming deliveries and outgoing waste products. Ensure that storage facilities include secondary containment provisions to prevent unintentional spills and leakage from contaminating aquifers and stormwater.

1 point

CM Credit 2

Indoor Pollutant Source Control: **High Hazard Chemicals**

Intent

Avoid exposure of building occupants to potentially hazardous indoor pollutants and chemicals that adversely impact air quality and human health.

Health Issues

Hospitals are particularly vulnerable to indoor air quality threats, as many building occupants are immunocompromised and have increased chemical susceptibilities. Equally important, the Joint Commission on the Accreditation of Healthcare Organizations (JCAHO) has expressed heightened concern over increasing respiratory issues among health care workers. JCAHO has identified indoor chemical pollutants as a contributing factor to indoor air quality concerns, including photocopiers, glutaraldehyde and ethylene oxide sterilants, xylene, aerosolized medication distribution systems, anesthetic gases, chemotherapeutic agents, latex, cleaners and floor finishes.

Credit Goals

- Develop a policy for receiving, handling, storing and disposing of high hazard substances. Include the purchasing department in developing standards for evaluating hazardous chemicals prior to purchase. These substances may include:
  - fixer and developer baths from X-ray departments
  - heavy-metal-based compounds containing silver, lead, copper, cadmium, chromium, mercury, or manganese
  - reactive/explosive substances such as azides and peroxide compounds such as hydrogen
  - peroxide, perchloric acid, peracetic acid, and perborates
  - hazardous microbiological cultures, dyes and solvents (e.g., gentian violet)
  - tissue fixing chemicals (e.g., osmium tetroxide, aldehydes or ethidium bromide used in genetic analysis)
  - substances from nuclear medicine/radiology (e.g., radioactive substances and iodoorganic contrast media)
  - used oil, thinners, varnish, and paint residues
  - concentrates of disinfectants and cleaning agents, bleaches and detaching agents
  - solvent mixtures (e.g., turpentine and nitro thinners)
  - sterilization gases (e.g., ethylene oxide)
  - anesthesia gases
  - formaldehyde (formalin), ethanol, and xylene from pathology operations

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CM Credit 2 continued

Indoor Pollutant Source Control: **High Hazard Chemicals**

- Minimize the use of hazardous chemicals in specific applications:
  - Substitute glutaraldehyde (GA) and Ethylene Oxide (EtO) sterilants when safer alternatives that maintain infection control standards are available.
  - Where glutaraldehyde must be used, ensure that enclosed reprocessing units limit the Threshold Limit Value (TLV – 15 min STEL) to 0.05 ppm or less.
  - Install controls for all high level chemical disinfectants and sterilants consistent with a presumption of high hazard.

Documentation

q Document policy regarding receiving, handling, storage and disposal of high hazard substances. Develop a registry of environmentally hazardous substances and materials, indicating the name of the compound, hazardous classification, usage and quantities, safety and environmental precautions, waste disposal requirements, and monitoring requirements.

q Document policy mandating elimination of glutaraldehyde and ethylene oxide or compliance with American Congress of Government Industrial Hygienists (ACGIH) Threshold Limit Value of 0.05 ppm.

q Compile an Indoor Air Quality (IAQ) Plan indicating routine review of locations of sterilization equipment, copiers, and other indoor pollutant sources to ensure that IAQ will be maintained.

q Include review of equipment locations as part of the initial building commissioning plan. Periodically monitor locations of installations of all portable sterilizing equipment.

Reference Standards

American Congress of Government Industrial Hygienists (ACGIH), www.acgih.org**.**

Potential Technologies & Strategies

Health care organizations should seek least toxic alternatives to processing equipment chemical use, including Phasing out the use of glutaraldehyde, xylene, and other chemicals used in sterilization processes.

Develop material handling and processing guidelines as a part of an environmental management system, and monitor implementation of guidelines as a part of final building commissioning. Guidelines should reduce consumption of hazardous materials, and prevent potential contamination of the surrounding environment. Consider providing dedicated centralized areas for receipt of, return of, and/or safe disposal of, hazardous materials. Also consider providing dedicated space in each lab for receipt of, return of, and/or safe disposal of, hazardous materials.

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CM Credit 2 continued

Indoor Pollutant Source Control: **High Hazard Chemicals**

Include an area for reporting of all hazardous material "transactions" to central inventory system. Develop decanting procedures that eliminate waste or allow for recycling of waste streams. Minimize proliferation of hazardous materials in laboratories by developing "just in time" inventory system.

Provide coordinated materials transport strategy that allows efficient "just in time" delivery of hazardous materials. Use alternative equipment or laboratory methods designed to reduce consumption of hazardous materials.

Resources

Greener Hospitals: Improving Environmental Performance, Edited by: Environment Science Center, Augsburg, Germany with support of Bristol-Myers Squibb (www.wzu.uni-augsburg.de/Publikationen/WZU_Publikationsreihe.html).

1 point

CM Credit 3.1

Chemical Discharge: **Chemical Waste Minimization Plan**

Intent

Protect natural habitat, waterways and water supply from pollutants carried by building discharge water.

Health Issues

The chemical composition of wastewater can have varying concentrations of specific chemicals that may represent exposure risks to aquatic ecosystems and public health. Wastewater from a 'typical' clinical laboratory could contain ionic mercury and organomercuric compounds, other heavy metals, organic chemicals, formaldehyde, blood products and body fluids and particulate matter, for example.

Credit Goals

- Protect municipal sewage treatment works from pollutant discharge from building operations.
- Prepare a chemical waste minimization plan to minimize or eliminate chemical waste drainage to the sanitary sewer system that includes:
  - A listing of chemical products and systems for the evaluation and implementation of least toxic alternatives. Priority areas include: Dialysis, Environmental Services, Facilities Management/Engineering, Laboratory/Pathology/Histology, Nutrition Services, Pharmacy, Radiology, Sterile Processing, Laundry and Surgical Services.
  - A description of chemical storage areas and description and implementation of secondary containment.

Documentation

- q Prepare a statement from a responsible party establishing the elimination of chemical waste to drain in cooling tower blowdown and/or boiler blowdown; prepare drawings and equipment specifications.
- q Compile regulations of the relevant Water & Sewer Utility indicating the maximum acceptable levels of effluent permitted.
- q Compile testing records, made quarterly for one year, showing compliance with the Credit Goals.
- q Develop an action plan to eliminate, minimize, substitute, recycle, and dispose of harmful chemicals safely, improving distribution, and limiting quantities, storage and waste.

Reference Standards

There is no reference standard for this credit.

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CM Credit 3.1 continued

Chemical Discharge: **Chemical Waste Minimization Plan**

Potential Technologies & Strategies

A hospital's main wastewater discharge flow may not warrant pre-treatment (except neutralization or radioactive decontamination). However, partial flows from hospital functional areas (e.g., laboratories, oncology, and pathology) should be carefully evaluated for opportunities to reduce discharge and improve quality.

Emphasize source reduction from discharge of all hazardous chemicals. Sources of toxic chemicals from health care facilities include infectious substances, laboratory discharge, building system operations, housekeeping (e.g. solvents and disinfectants), food services (e.g. soaps, chlorine), and diagnostic and treatment areas (e.g. glutaraldehyde, radioactive substances). In principle, it should always be assumed that waste materials, until properly evaluated, should not be disposed of in the wastewater system.

Minimize use of hazardous materials in relationship to testing and experimental volume.

Use automated laboratory equipment that maximizes sample throughput while minimizing sample size, reagent quantity, and waste streams. Work with EHS personnel and wastewater authorities in developing action plan.

Explore technologies and strategies to eliminate chemical waste to drain in cooling tower and boiler blowdown. Treat blowdown so that chemical treatment can be reclaimed for re-use.

Take steps to prevent accidental discharges to drain, such as raised lips around cup sinks, working over trays.

Use non-chemical water treatments such as ozonation or ultraviolet radiation.

Hospitals are one of the few known sources of the heavy metal gadolinium (from nuclear magnetic resonance imaging) in wastewater. Little is known about gadolinium's environmental impact.

Discharging concentrates of disinfecting and cleaning agents should be avoided — particularly chlorine, phenols, quaternary ammonium compounds, and products containing nonylphenol (potentially estrogenic effect) and strong cleaning ingredients.

Resources

Hospitals for a Healthy Environment (H2E) has published materials to assist in the development of a chemical minimization plan, www.h2e-online.org/tools/chemical.htm.

Medical, Academic and Scientific Community Organization (MASCO), Boston, MA: Mercury Work Group, www.masco.org/mercury/techid/types.html.

Greener Hospitals: Improving Environmental Performance, Edited by: Environment Science Center, Augsburg, Germany with support of Bristol-Myers Squibb (www.wzu.uni-augsburg.de/Publikationen/WZU_Publikationsreihe.html).

1 point

CM Credit 3.2

Chemical Discharge: **Pharmaceutical Waste Discharge**

Intent

Reduce pharmaceutical wastes in sanitary sewer discharge.

Health Issues

A study by the US Geological Survey found pharmaceutical residue in 80% of water tested in the U.S. in testing conducted in 1999 and 2000. The chemical composition of wastewater can have varying concentrations of specific chemicals that may represent exposure risks to aquatic ecosystems and public health. Wastewater treatment facilities were not designed to treat pharmaceutical wastes. Many are hazardous; antibiotics and hormones affect species downstream of treatment facilities.

Credit Goals

- Develop an integrated pharmaceutical waste management system in which all waste bulk chemotherapy items are segregated and managed as hazardous waste, all other waste pharmaceuticals are segregated into hazardous or non-hazardous waste, and no antibiotics, hormones or other pharmaceutical waste is drain disposed to the sanitary sewer system.
- Develop a pharmaceutical waste minimization plan that includes:
  - Non-hazardous pharmaceutical waste: Segregate into dedicated containers for disposal at a regulated landfill permitted to accept non-hazardous pharmaceutical waste;
  - Non-chemotherapy pharmaceutical waste that meets the definition of a hazardous waste: Identify, segregate, label, store, and manage as hazardous waste as defined in the Resource Conservation and Recovery Act (RCRA).
  - Bulk chemotherapy waste: Segregate from trace chemotherapy waste, label, store, and manage bulk chemotherapy waste as hazardous waste as defined in the RCRA.

Documentation

q Compile and maintain an Integrated Pharmaceutical Waste Management Plan that addresses the above Credit Goals.

q Document the process used to dispose of all regulated pharmaceutical waste items.

Reference Standards

Resource Conservation Recovery Act (RCRA) is described at http://www.epa.gov/rcraonline/.

Potential Technologies & Strategies

Examine all non-hazardous pharmaceutical waste and segregate it into dedicated containers for disposal at a regulated landfill permitted to accept non-hazardous pharmaceutical waste.

Uncontrolled disposal of mercury-containing drugs, diagnostic agents (e.g., Thiomersal®), disinfectants (e.g., Merbromin®, Mercurochrome® and Nitromersol®), and diuretic agents (e.g., mercurophyllin) should be avoided.

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CM Credit 3.2 continued

Chemical Discharge: **Pharmaceutical Waste Discharge**

Resources

Hospitals for a Healthy Environment (H2E) has publishede materials to assist in the development of a chemical minimization plan, http://www.h2e-online.org/tools/chemical.htm.

U.S. EPA http://web.archive.org/web/20030627025308/www.epa.gov/esd/chemistry/ppcp/greenpharmacy-intro.htm.

Greener Hospitals: Improving Environmental Performance, Edited by: Environment Science Center, Augsburg, Germany with support of Bristol-Myers Squibb (www.wzu.uni-augsburg.de/Publikationen/WZU_Publikationsreihe.html).

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Waste Management

Required **WM Prerequisite 1**

Waste Stream Audit

Intent

Establish minimum source reduction and recycling program elements and quantify current waste stream production volume.

Health Issues

Since the 1998 Memorandum of Understanding between the U.S. EPA and the American Hospital Association mandating a 33% reduction in total waste volumes by 2005 and 50% by 2010, hospitals have initiated ambitious waste sorting and recycling programs. In response to the 1996 EPA finding that medical waste incineration was the leading contributor to dioxin emissions in the United States, many hospitals have dramatically reduced the volume of medical waste that is incinerated, and have installed alternative technologies on site. Moreover, hospitals are returning to the use of reusable rather than disposable products, which reduces reliance on waste processing systems. Each of these responses reduces the release of highly toxic chemicals into the environment.

Initiating and implementing a Waste Management Plan generates cost savings, as tipping fees for waste disposal continue to increase. Reducing medical waste volumes lowers disposal costs, while proper waste stream management allows for safer, effective disposal methods.

Credit Goals

- Conduct a waste stream audit of the ongoing waste stream to establish a current baseline identifying the types and amounts of waste stream constituents. At a minimum, the audit should determine the amounts for paper, glass, plastics, cardboard, regulated medical waste, hazardous waste and metals in the waste stream. Operate over the performance period a procurement/management policy to reduce waste stream through purchasing strategies, collection station equipment and occupant education.

Documentation

- ❑ Complete the waste stream audit to establish building waste baseline.
- ❑ Compile the procurement/management policy implemented to reduce waste stream through purchasing strategies, collection station equipment and occupant awareness notices.

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WM Prerequisite 1 continued

Waste Stream Audit

Potential Technologies & Strategies

Develop a plan to reduce the building's waste stream. Start by conducting a waste stream audit to establish a current baseline. Then evaluate how each type of waste identified in the waste stream can be reduced through source reduction, reuse and recycling.

Finally develop, implement and maintain the building's waste reduction plan including procurement/management policies to reduce waste stream through purchasing strategies, reuse and recycling, collection station equipment and agreements, and occupant education needed for the successful achievement of the waste reduction goals.

The waste reduction plan should include consideration of the following:

- avoiding waste by modifying a process/procedure (for example, emphasize electronic rather than paper record-keeping systems)
- buying environmentally-friendly products
- managing waste (separation of different kinds of waste; recycling)
- examining materials to see if they pose a potential environmental or health risk prior to their purchase and use
- reducing the amount of products and equipment containing chlorinated polymers (e.g., neoprene, polyvinyl chloride (PVC), chlorinated polyvinyl chloride, chlorinated polyethylene (CPE), chlorosulfinated polyethylene (CSPE))
- identifying toxic substances, including lab chemicals and reducing the amount used, particularly those chemicals classified as persistent, bioaccumulative and toxic chemicals (PBTs)
- evaluating waste and waste sources regularly and looking for markets for waste products

Resources

Chapter 5, *Greener Hospitals: Improving Environmental Performance*, Edited by: Environment Science Center, Augsburg, Germany with support of Bristol-Myers Squibb (www.wzu.uni-augsburg.de/Publikationen/WZU_Publikationsreihe.html).

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3 points

WM Credit 1

Total Waste Reduction

Intent

Reduce solid waste disposal in landfills and incinerators generated by health care facilities through reduction, reuse, recycling and composting.

Health Issues

Since the 1998 Memorandum of Understanding between the U.S. EPA and the American Hospital Association mandating a 33% reduction in total waste volumes by 2005 and 50% by 2010, hospitals have initiated ambitious waste sorting and recycling programs. In response to the 1996 EPA finding that medical waste incineration was the leading contributor to dioxin emissions in the United States, many hospitals have dramatically reduced the volume of medical waste that is incinerated, and have installed alternative technologies on site. Moreover, hospitals are returning to the use of reusable rather than disposable products, which reduces reliance on waste processing systems. Each of these responses reduces the release of highly toxic chemicals into the environment.

Initiating and implementing a Waste Management Plan generates cost savings, as tipping fees for waste disposal continue to increase. Reducing medical waste volumes lowers disposal costs, while proper waste stream management allows for safer, effective disposal methods.

Credit Goals

- Have in place over the performance period a Waste Management Plan and implementation strategies to prioritize reduction, reuse, recycling, and composting to divert wastes from disposal in landfills and incinerators.
- Incorporate steps into the facility's Waste Management Plan to eliminate, minimize, substitute and safely dispose of wastes generated by the facility using reduction of disposables and single use devices.
- Incorporate steps into the facility's Waste Management Plan that address the separation, collection and storage of materials for recycling, including (at a minimum) paper, glass, plastics, cardboard/OCC, metals, batteries and fluorescent lamps. The Plan should be designed to collect and recycle a minimum of 95% of batteries and a minimum of 95% of fluorescent lamps discarded. Each time reusable architectural elements, such as panels, are moved and reinstalled, they can be counted as part of the total waste stream and included in the recycled component of the waste stream.
- Incorporate steps into the facility's Waste Management Plan to implement best available technology (BAT) alternatives to incineration

AND

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WM Credit 1 continued

Total Waste Reduction

- For existing health care facilities, reduce total waste below 1998 levels as indicated in the table which follows (by weight or volume):

Credit 1.1	Reduce 30% of total waste stream
Credit 1.2	Reduce 40% of total waste stream (1 point in addition to 1.1)
Credit 1.3	Reduce 50% of total waste stream (1 point in addition to 1.2)

Documentation

- Complete the Waste Management Plan, highlighting the types and volumes or weights of total wastes generated, and the volumes or weights of regulated medical waste, demonstrating compliance with above.
- Compile a copy of the organizational recycling policy.
- Compile quarterly summary reports on the total waste produced by the building along with hauler documentation and calculations of the amount of each type of waste that has been disposed of or recycled over the performance period.

Reference Standards

The American Hospital Association (AHA) and the United States Environmental Protection Agency (EPA) signed a Memorandum of Understanding identifying goals to reduce the impact of health care facilities on the environment, including specific waste reduction goals. http://www.h2e-online.org/about/mou.htm.

Potential Technologies & Strategies

The waste management plan should stipulate the categories and volumes of waste for disposal and the methods of handling and disposal of each type of waste. At a minimum, the Plan should consider general trash, medical and infectious wastes, and hazardous waste. The plan should outline waste reductions achieved through environmentally preferable purchasing strategies, such as reduction of single use devices.

Provide dedicated central areas for receiving, returning, and/or safely disposing of hazardous materials. Segregate and secure biohazardous and environmentally hazardous materials, including mercury, nuclear reagent waste, and other regulated waste types.

Operational strategies include, for example, installation of reusable sharps containers, substitution of reusable versus disposable food service products and Operating Room instruments and linens, substitution of reusable for disposable gowns, reduction in packaging waste through specific contractual terms with supply vendors.

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WM Credit 1 continued

Total Waste Reduction

Assess all commodities received to reduce or eliminate unnecessary packaging, e.g., purchase bulk shipments in large containers rather than individual packaging, investigate shrink-wrapped shipment rather than elaborate boxing. Encourage vendors to creatively reduce their packaging and specify as a purchasing preference.

Resources

Hospital Waste Reduction, California Integrated Waste Management Board, February 1999. www.ciwmb.ca.gov.

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2 points

WM Credit 2

Regulated Medical Waste Reduction

Intent

Reduce solid waste disposal in landfills and incinerators generated by health care facilities through reduction, reuse, recycling and composting.

Health Issues

In response to the 1996 EPA finding that medical waste incineration was the leading contributor to dioxin emissions in the United States, many hospitals have dramatically reduced the volume of medical waste that is incinerated, and have installed alternative technologies on site. Moreover, hospitals are returning to the use of reusable rather than disposable products, which reduces reliance on waste processing systems. Each of these responses reduces the release of highly toxic chemicals into the environment.

Reducing medical waste volumes lowers disposal costs, while proper waste stream management allows for safer, effective disposal methods.

Credit Goals

Credit 2.1 - 1 point

- Demonstrate that total regulated medical waste volume or weight is less than 10% of the solid waste stream from the facility.

Credit 2.2 - 1 point

- Demonstrate that incineration is used only to dispose of the fraction of the regulated medical waste stream required by regulations to be incinerated. (Pyrolysis is not considered an acceptable alternative to incineration.)

Documentation

- q Review the Waste Management Plan, highlighting the types and volumes or weights of total wastes generated, and the volumes or weights of regulated medical waste, demonstrating compliance with above.
- q Document on-site alternative (non-incineration and non-pyrolysis) medical waste treatment technologies, and a description of the technology selected **OR** obtain a contract with a provider for off-site alternate (non-incineration and non-pyrolysis) technology waste treatment.

Reference Standards

1998 Memorandum of Understanding (MOU) between American Hospital Association (AHA) and the U.S. EPA identifies pollution prevention goals for health care facilities, including waste reduction goals. http://www.h2e-online.org/about/mou.htm

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WM Credit 2 continued

Regulated Medical Waste Reduction

Potential Technologies & Strategies

Assess all red bag generating locations and maximize reduction opportunities. Assess each location for detailed function. Provide adequate training for all staff to ensure only appropriate discards are disposed in red bags. Remove unnecessary red bag receptacles as they will encourage inappropriate disposal.

Resources

Non-Incineration Medical Waste Treatment Technologies, Health Care Without Harm, August 2001. www.noharm.org.

1 point

WM Credit 3

Food Waste Reduction

Intent

Reduce solid waste disposal in landfills and incinerators generated by health care facilities through reduction, reuse, recycling and composting.

Health Issues

A 1998 Memorandum of Understanding between the U.S. EPA and the American Hospital Association targeted a 33% reduction in total waste volume by 2005; 50% by 2010. Food and organics are the second largest constituent of the health care waste stream, comprising close to 20% of the solid waste volume in medical facilities with food service operations.

A significant strategy to divert waste constituents from disposal while also contributing to ecosystem health is through beneficial reuse of organic matter. Composting organic matter and applying it to the soil increases soil micronutrients, and reduces reliance on chemical fertilizers and their associated industrial, ecologic and health burdens.

Credit Goals

- Develop a food waste diversion and collection plan, consistent with health and solid waste regulations, for all food use areas including but not limited to: catering, patient rooms, cafeteria and food preparation areas.
- Divert a minimum of 75% of food service organic waste by weight from the solid waste stream. Diversion may include any combination of animal feed, compost or donation. Provide controlled areas to facilitate easy removal of food waste, consistent with facility Integrated Pest Management (IPM) plan.

Documentation

q Prepare a space program and plan showing the area(s) dedicated to food waste collection and storage (and composting if applicable).

q Prepare a copy of contract(s) with food waste hauler (or others) demonstrating compliance with the intent of this credit.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Include the requirements associated with the food waste collection system in the space program, including storage spaces. Determine size of spaces based upon volume of projected waste and length of time anticipated for storage. Consider integrated pest management issues in design.

Consider implementation of on site composting programs for kitchen and food wastes, or contract with private or municipal compost ventures or farmers for handling of food waste.

Consider donation of unused foods to local food banks and/or related organizations.

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Environmental Services

2 points

ES Credit 1

Outdoor Grounds & Building Exterior Management

Intent

Encourage grounds/site/building exterior management practices that preserve ecological integrity, enhance biodiversity and protect wildlife while protecting the health of building occupants.

Health Issues

Building occupants' health can be directly impacted by the use of pesticides, including herbicides, insectides, fungicides, and termiticides, and toxic snow removal chemicals. In health care environments, pesticides applied outdoors can impact indoor air quality when applied proximate to air intakes and by being tracked inside on shoes and equipment. Many chemicals commonly used on health care facility grounds have not been tested for their low-level, long-term health impacts. Some pesticides are included on Persistent Bioaccumulative and Toxic Chemical (PBT) lists for avoidance.

Credit Goals

- Have in place over the performance period a low-impact site and green building exterior management plan that addresses the topics listed below. One point is earned for each four items addressed:
  - Maintenance equipment
  - Plantings
  - Animal and vegetation pest control
  - Landscape waste
  - Fertilizer use
  - Snow removal (where applicable)
  - Cleaning of building exterior
  - Paints and sealants used on building exterior
  - Other maintenance of the building exterior

Documentation

q Compile a narrative overview of an organizational management plan for establishing/maintaining a low-impact site and building exterior plan that addresses and specifically highlights the actions from the list in the Credit Goals that are being implemented.

q Compile quarterly reports over performance period documenting that this management plan is being implemented on an ongoing basis.

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ES Credit 1 continued

Outdoor Grounds & Building Exterior Management

Reference Standards

Potential Technologies & Strategies

Have in place over the performance period a low-impact site and green building exterior management plan that addresses overall site management practices, chemical/fertilizer/pest management/snow removal practices, building exterior cleaning and maintenance practices.

Prepare plan for establishing and maintaining a least toxic grounds management strategy that includes the implementation of IPM and Plant Health Care (PHC) programs.

Use indigenous and/or drought-tolerant plants that are naturally resistant and that provide food for wildlife. Provide water sources for wildlife drinking and bathing unless doing so would enhance rodent or other pest populations or would encourage wildlife in the vicinity of the facility. Implement low impact fertilizer programs.

Integrated Pest Management (IPM) is a coordinated approach to pest control that seeks to prevent unacceptable levels of pests by the most cost-effective means with the least possible hazard to building occupants, workers, and the environment. The focus of IPM is on non-chemical prevention of pest problems. IPM emphasizes consideration of all management options. Preferential management methods include cultural, mechanical, physical, and biological controls, with a least hazardous pesticide used only as a last resort. “Least toxic” pesticides refers to those that have low or no acute or chronic toxicity to humans, affect a narrow range of species, and are formulated for application in a manner that limits or eliminates exposure of humans and other non-target organisms. See EPA website for list of pesticides.

Also include green landscape management actions, such as using a greater variety of plants, using more native plants, reducing size of lawns, changing maintenance practices, reducing the use of power equipment, stormwater control, using fertilizer on an as-needed basis, composting waste, applying integrated pest management, creating wildlife habitat, avoiding/removing invasive plants, protecting natural areas and using plants to reduce heating and cooling needs.

Plant health care management is a concept in managing landscape developed from Integrated Pest Management. PHC emphasizes plant health and horticultural practice, recognizing that health is impacted not only by pests, but improper irrigation, compacted soils, and other landscape conditions. In landscape maintenance, keep vegetation, shrubs and mulch a minimum of 1’ away from structures. Apply organic fertilizers several times annually rather than a single, heavy application. Use methods of spot treatment of non toxic or least toxic pesticides rather than area wide applications. Use mulching mowers to significantly reduce yard waste generation, fertilizer needs and water consumption through retention of organic matter.

Investigate least toxic snow removal strategies (including snowmelt piping, canopies or covered walkways) and identify low impact sites for dumping snow.

Include green cleaning and maintenance practices and materials that minimize environmental impacts in the green building exterior management plan.

ES Credit 1 continued

Outdoor Grounds & Building Exterior Management

Resources

Pennsylvania Green Building Operations and Maintenance Manual; www.dgs.state.pa.us/dgs/lib/dgs/green_bldg/greenbuildingbook.pdf.

Healthy Hospitals, Controlling Pest without Harmful Pesticides, 2003.

Hospitals for a Healthy Environment: www.h2e-online.org.

Beyond Pesticides: www.beyondpesticides.org.

Health Care Without Harm: www.noharm.org.

Insect Management for the Interiorscape Environment: http://ipm.ncsu.edu/InteriorScapes/insect.html.

US EPA, Integrated Pest Management for Schools: A How-to Manual, EPA 909-B-97-001, March, 1997. www.epa.gov.

2 points

ES Credit 2

Indoor Integrated Pest Management

Intent

Reduce human exposure to physical and chemical hazards and odors associated with pest management products and practices by employing custodial operations that use safe methods and low-toxicity or non-toxic pest management products.

Health Issues

The health of building occupants is directly impacted by the use of chemical pesticides, termiticides, and rodenticides. In health care environments, pesticides may impact the indoor air quality both in their exterior applications proximate to air intakes, and in the use of chemical pesticides for indoor pest control. Integrated Pest Management (IPM) is a cost effective coordinated approach to pest control that seeks to prevent unacceptable levels of pests with the least possible hazard to building occupants, workers, and the environment. The focus of IPM is on non-chemical prevention of pest problems. Preferential management methods include cultural, mechanical, physical and biological controls, with least hazardous pesticides used only as a last resort.

Credit Goals

- Develop and implement an Integrated Pest Management Program for managing pest control in the building interior, including, at a minimum:
  - Methods of identifying pests and monitoring levels of infestation.
  - Stated action thresholds, or the level of infestation that can be tolerated.
  - Listing of preventive or corrective actions to be employed (such as sanitation, structural repairs, and ongoing maintenance), traps, and the judicious use of least toxic chemical pesticides.
- The plan shall promote safer alternatives to chemical pesticides while preventing economic and health damage caused by pests. The plan shall implement the use of IPM techniques to reduce the need for reliance on chemical pesticides. When pesticides may be necessary, the plan shall ensure that clear and accurate notification concerning the use of pesticides be made available so that measures may be taken to prevent and address pest problems effectively without endangering occupants, janitorial workers or visitors.
- The plan shall include a communication strategy to provide notification of the IPM system. This shall include information and notice to tenants or directly to occupants in an owner-occupied building. The notice shall include a description of the integrated pest management system and a list of all pesticides, including any least toxic pesticide that may be used in the building as part of the integrated pest management system; the name, address, and telephone number of the contact person of the building; and a statement that the contact person maintains the product label and material safety data sheet (MSDS) of each pesticide used in the building, that the label or MSDS is available for review upon request, and that the contact person is available for information and comment.
- The communications strategy shall address “Universal Notification,” which requires notification not less than 72 hours before a pesticide, other than a least toxic pesticide, is applied in a building.

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ES Credit 2 continued

Indoor Integrated Pest Management

- The plan shall address under what circumstances an emergency application of pesticides in a building or on surrounding grounds being maintained by the building can be conducted without complying with the earlier provisions. In addition, address notification strategies to ensure that occupants and janitorial workers are notified within 24 hours of the pesticide application.

Documentation

q Compile the Integrated Pest Management (IPM) Program developed by the facility.

q Verify that the Integrated Pest Management Program has been followed during the performance period.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Basic IPM strategies include maintenance and repair of the basic structural integrity of the building, including:

- Design and construct buildings to be as pest resistant as possible and maintain them well.
- Eliminate cracks and holes to keep pests out. Lightly dust gaps between walls and other voids with boric acid before closing them up.
- Eliminate cracks and holes to keep pests out. Lightly dust gaps between walls and other voids with boric acid before closing them up.
- Use physical barriers to block pest entry and movement (such as door sweeps, screens at chimneys and air intakes, doors and windows).

Implement and enforce sanitation procedures to limit pests' access to food and drink. Address leaky faucets, condensation on pipes, and all edibles. Store refuse in tightly sealed containers, and in controlled areas of the building.

Use least toxic pesticides judiciously only as last resort. "Least toxic" are those that have low or no acute or chronic toxicity to humans, affect a narrow range of species, and are formulated for application in a manner that limits or eliminates exposure of humans and other non-target organisms.

Examples include products formulated as baits (e.g, boric acid), pastes or gels which do not volatize in the air and which utilize very small amounts of the active ingredient pesticide, insecticidal and herbicidal soaps; and microbial pesticides (e.g., *bacillus thuringiensis (B.t.)* formulated from fungi, bacteria, or viruses that are only toxic to specific pest species but harmless to humans, and natural substances such as corn gluten meal., See EPA web site for list of least-toxic pesticides.

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ES Credit 2 continued

Indoor Integrated Pest Management

Resources:

On Preparing IPM programs and Examples:

Healthy Hospitals, Controlling Pests without Harmful Pesticides, 2003. Beyond Pesticides and Health Care Without Harm, www.noharm.org.

US EPA, Integrated Pest Management for Schools: A How-to Manual, EPA 909-B-97-001, March, 1997. www.epa.gov.

For Chemical Information:

EXTOXNET Pesticide Information Profiles (PIP); http://ace.ace.orst.edu/info/extoxnet.

For information on Alternatives to Pesticides:

Beyond Pesticides, 701 E Street, SE, Suite 200 Washington, DC 20003, www.beyondpesticides.org.

The Bio-Integral Resource Center (BIRC), PO Box 7414, Berkeley, CA 94704, www.birc.org.

Washington Toxics Coalition, 4516 University Way, Seattle, WA 98105, www.watoxics.org.

Northwest Coalition for Alternatives to Pesticides, PO Box 1393 Eugene, OR 77440-1393, www.pesticide.org.

1 point

ES Credit 3

Environmentally Preferable Cleaning Policy

Intent

Limit exposure of building occupants and maintenance personnel to potentially hazardous chemical, biological and particulate contaminants.

Health Issues

Sustainable maintenance practices are an essential part of sustainable building. Traditional cleaning products present a variety of human health and ecological concerns. They may contribute to poor indoor air quality and contain chemicals that cause cancer, reproductive disorders, respiratory ailments (including occupational asthma), eye and skin irritation, central nervous system impairment, and other human health effects. In addition, some of these products contain persistent bioaccumulative and toxic chemicals (PBTs), are classified as hazardous waste, and/or otherwise contribute to environmental pollution during their manufacture, transport, use, and/or disposal.

In health care settings, continuous 24/7 building occupancy leads to the requirement for cleaning while the building is occupied. Non-toxic and least-toxic sustainable maintenance products exist for virtually every health care facility need. Using "green" cleaners can reduce maintenance costs, protect the environment, safeguard the health of building occupants, increase employee productivity and improve indoor air quality.

Credit Goals

- Develop and maintain an environmentally preferable cleaning policy for all surfaces, including floors, walls, furniture and medical equipment addressing:
  - Sustainable floor care systems that employ "metal free" floor finish that extends the period between stripping and recoating for at least 12 months, with a preference for phthalate-free products.
  - Levels of required disinfection for all surfaces.
  - Sustainable cleaning systems.
  - Use of sustainable cleaning products.
  - Use of chemical concentrates and appropriate dilution systems.
  - Proper training of maintenance personnel in the hazards, use, maintenance and disposal of cleaning chemicals, dispensing equipment and packaging.
  - Use of hand soaps that do not contain antimicrobial agents (other than as a preservative system), except where required by health codes and other regulations (i.e., food service and health care requirements).
  - Use of cleaning equipment that does not negatively impact IAQ.

ES Credit 3 continued

Environmentally Preferable Cleaning Policy

- Standards should include:
  - General cleaning and building maintenance products that comply with the minimum criteria established by Green Seal's Industrial and Institutional Cleaners Standard GS-37 for those categories covered or California Code of Regulations low-VOC cleaning Products for those categories not covered.
  - Levels of required disinfection for all surfaces. The policy should differentiate those areas where cleaning of surfaces requires intermediary grade disinfectants (such as surfaces with routine exposure to blood), areas and surfaces where lower grade disinfectants/ sanitizers are appropriate, and areas where cleaners (non-FIFRA) products are sufficient.
  - Training of cleaning personnel, quality assurance, infection control and other personnel involved in maintenance, housekeeping, and purchasing, in both chemical safety as well as the above specific policies and procedures with regard to floor care systems and disinfection of surfaces. Training shall include procedures to reduce impacts from cleaning products on the health of facility occupants and the environment.
  - Minimize added fragrances in cleaning products.

Documentation

- ☐ Compile the environmentally preferable cleaning policy adopted by your organization.
- ☐ Verify that this policy has been followed over the performance period.
- ☐ Confirm the chemical and cleaner dispensing and dilution equipment used.
- ☐ Identify the date and activities associated with floor maintenance.
- ☐ Document training of facility maintenance, superintendent and cleaning staff.

Reference Standards

Green Seal Industrial and Institutional Cleaners Standard GS-37,
http://www.greenseal.org/standards/industrialcleaners.htm.

Green Seal Certified Cleaners, http://www.greenseal.org/certproducts.htm.

California Air Resources Board, www.calregs.com.

Potential Technologies & Strategies

Have in place over the performance period an environmentally preferable cleaning policy that addresses sustainable cleaning and hard flooring coating systems products, utilization of concentrated cleaning products and associated housekeeping protocols. Floor coating products that are free of metals (e.g., zinc) and phthalates are preferred.

3 points

ES Credit 4

Sustainable Cleaning Products & Materials

Intent

Limit exposure of building occupants and maintenance personnel to potentially hazardous chemical, biological and particulate contaminants.

Health Issues

Sustainable maintenance practices are an essential part of sustainable building. Traditional cleaning products present a variety of human health and ecological concerns. They may contribute to poor indoor air quality and contain chemicals that cause cancer, reproductive disorders, respiratory ailments (including occupational asthma), eye and skin irritation, central nervous system impairment, and other human health effects. In addition, some of these products contain persistent bioaccumulative and toxic chemicals (PBTs), are classified as hazardous waste, and/or otherwise contribute to environmental pollution during their manufacture, transport, use, and/or disposal.

In health care settings, continuous 24/7 building occupancy leads to the requirement for cleaning while the building is occupied. Non-toxic and least-toxic sustainable maintenance products exist for virtually every health care facility need. Using "green" cleaners can reduce maintenance costs, protect the environment, safeguard the health of building occupants, increase employee productivity and improve indoor air quality.

Credit Goals

- Adopt and implement sustainable purchasing policy for cleaning products and materials. Cleaning product and material purchases include building purchases for use by in house staff or used by outsourced service providers. Calculate the percentage of the total sustainable material and product purchases on a cost basis that meet the following sustainability criteria:
  - Cleaning products that meet the Green Seal GS-37 standard if applicable, OR if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.
  - Minimize added fragrances in cleaning products.

Credit 4.1	Purchase sustainable for 30% of annual purchases (1 point)
Credit 4.2	Purchase sustainable for 60% (1 point in addition to 4.1)
Credit 4.3	Purchase sustainable for 90% (1 point in addition to 4.2)

Documentation

- q Compile the organizational policy that specifies use of sustainability criteria for purchases of covered materials for use in the building or on the site.
- q Document all covered materials purchases that meet the specified sustainability criteria and the cost of these purchases over the performance period.
- q Calculate the fraction of covered materials purchased that meet the specified sustainability criteria (on a cost basis).

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ES Credit 4 continued

Sustainable Cleaning Products & Materials

Reference Standards

Green Seal Industrial and Institutional Cleaners Standard GS-37, http://www.greenseal.org/standards/industrialcleaners.htm.

Green Seal Certified Cleaners, http://www.greenseal.org/certproducts.htm.

California Air Resources Board, www.calregs.com.

Occupational Asthmagen List: www.remcomp.com/asmanet/asmapro/asmawork.htm.

ASTM E1971-98, Standard Guide for Stewardship for the Cleaning of Commercial and Institutional Buildings.

Potential Technologies & Strategies

Operations and maintenance practices ensure that the building functions at its highest levels of energy efficiency and indoor air quality performance. Scheduled maintenance and cleaning practices impact energy savings and occupant health and comfort. Effective operations and maintenance strategies include:

- Phase out the use of flooring materials that require ongoing stripping and waxing procedures to achieve their performance. Seek out the least toxic stripping and waxing protocols available for each flooring installation. Equip floor buffers and burnishers with an enclosed system for capturing chemical vapors and particulate matter generated during the cleaning process.
- Use high-efficiency vacuum bags or high efficiency particulate air (HEPA) filters in compliance with cited standards, as carpets tend to be "sinks" for dirt and dust. Maintain carpets though hot water extraction methods; avoid overwetting. Water-damaged carpets can harbor mold, mildew or bacteria. .For HEPA Vacuum Systems reference: ASTM F1977-99 Full Vacuum Fractional Efficiency. For HEPA filters: ASTM 1471-93(2001) Air Cleaning Performance of a High Efficiency Particulate Air-Filter System.
- Establish cleaning and maintenance protocols in the context of an overall Indoor Air Quality Plan. Coordinate housekeeping and custodial operations with building ventilation schedules to ensure that adequate ventilation is provided, both during and after cleaning activities.
- Replace aerosolized application methods in favor of pour and wipe to decrease airborne concentrations of chemicals. Use portion control devices such as mechanical dispensers, which help insure the safe mixing of cleaning solutions, save packaging, and reduce chemical consumption.
- Refer to applicable state and local ordinances and guidelines; many states are enacting standards for building maintenance products.
- Specify textiles (upholstery) that can be cleansed with water based, not solvent based cleaners.

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ES Credit 4 continued

Sustainable Cleaning Products & Materials

All general cleaning products should be environmentally preferable and, at a minimum, meet the criteria established by Green Seal's Industrial and Institutional Cleaners Standard GS-37. To meet Green Seal standards a product must not be acutely toxic to humans; contain no carcinogens or reproductive toxicants; not be corrosive to eyes or skin; not be a skin sensitizer; not be combustible; contain no or low VOCs (volatile organic compounds); not be toxic to aquatic life; be biodegradable; contain low or no phosphorus; be a concentrate; have recyclable or reusable packaging; contain no alkylphenol ethoxylates, dibutyl phthalate, heavy metals (arsenic, lead, cadmium, cobalt, chromium, mercury, nickel, selenium), or ozone-depleting compounds; and come with proper labeling and training on product use.

Prohibit products that are manufactured with mutagens and teratogens; aerosols; asthma-causing agents (asthmagens), respiratory irritants, and chemicals that aggravate existing respiratory conditions; neurotoxins; endocrine modifiers; benzene-based solvents, butoxyethanol, chlorinated organic solvents, and paradichlorobenzene; very acidic or alkaline products; anti-microbial agents in hand soaps for patients and visitors; persistent, bioaccumulative and toxic chemicals (PBTs); and products requiring disposal as hazardous waste. Use combination cleaner/disinfectants; use fragrances and dyes judiciously, and only as necessary or where appropriate.

Resources

INFORM, Inc. Cleaning for Health: Products and Practices for a Cleaner Indoor Environment, August, 2002, http://www.informinc.org/cleanforhealth.php.

US EPA," Environmentally Preferable Products Program,"
http://www.epa.gov/oppt/epp/documents/docback.htm.

PA Department of General Services,
www.dgs.state.pa.us/dgs/lib/dgs/green_bldg/greenbuildingbook.pdf.

Scorecard- Environmental Defense, www.scorecard.org/chemical-profiles/index.tcl.

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1 point

ES Credit 5

Environmentally Preferable Janitorial Equipment

Intent

Limit exposure of building occupants and maintenance personnel to potentially hazardous chemical, biological and particulate contaminants.

Health Issues

Sustainable maintenance practices are an essential part of sustainable building. Traditional cleaning products present a variety of human health and ecological concerns. They may contribute to poor indoor air quality and contain chemicals that cause cancer, reproductive disorders, respiratory ailments (including occupational asthma), eye and skin irritation, central nervous system impairment, and other human health effects. In addition, some of these products contain persistent bioaccumulative and toxic chemicals (PBTs), are classified as hazardous waste, and/or otherwise contribute to environmental pollution during their manufacture, transport, use, and/or disposal.

In health care settings, continuous 24/7 building occupancy leads to the requirement for cleaning while the building is occupied. Non-toxic and least-toxic sustainable maintenance products exist for virtually every health care facility need. Using "green" cleaners can reduce maintenance costs, protect the environment, safeguard the health of building occupants, increase employee productivity and improve indoor air quality.

Credit Goals

- Develop, implement and maintain a policy for the use of janitorial equipment that maximizes effective reduction of building contaminants while minimizing environmental and health burdens.
- Required elements in the Cleaning Equipment Policy include:
  - Vacuum cleaners meet the requirements of the Carpet & Rug Institute Green Label Program and are capable of capturing 96% of particulates 0.3 microns in size and operate with a sound level less than 70dBA.
  - Hot water extraction equipment for deep cleaning carpets is capable of removing sufficient moisture such that carpets can dry in less than 24 hours.
  - Powered maintenance equipment including floor buffers, burnishers and automatic scrubbers is equipped with vacuums, guards and/or other devices for capturing fine particulates, and shall operate with a sound level less than 70dBA.
  - Propane-powered floor equipment has high-efficiency, low-emissions engines.
  - Automated scrubbing machines are equipped with variable-speed feed pumps to optimize the use of cleaning fluids.
  - Battery-powered equipment is equipped with environmentally preferable gel batteries.
  - Where appropriate, active micro fiber technology is used to reduce cleaning chemical consumption and prolong life of disposable scrubbing pads.

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ES Credit 5 continued

Environmentally Preferable Janitorial Equipment

- Powered equipment is ergonomically designed to minimize vibration, noise and user fatigue.
- Equipment has rubber bumpers to reduce potential damage to building surfaces.
- A logbook will be kept for all powered housekeeping equipment to document the date of equipment purchase and all repair and maintenance activities and include vendor cut sheets for each type of equipment in use.

Documentation

q Provide a copy of the environmentally preferable janitorial equipment policy adopted by your organization.

q Provide a record of the janitorial equipment used in the building and a log of the maintenance of each piece of equipment over the performance period. Include vendor specifications for each type of equipment in use.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Develop, implement and maintain a policy for the use of janitorial equipment that maximizes effective reduction of building contaminants while minimizing environmental and health burdens. Evaluate the janitorial equipment currently being used and make a plan for upgrading to janitorial equipment consistent with this policy.

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Environmentally Preferable Purchasing

1 point **EP Credit 1.1**

Food: **Organic or Sustainable**

Intent

Support sustainable food production and improved environmental health through purchase of organic, drug free and locally produced food products.

Health Issues

Conventional food production is pesticide intensive resulting in occupational hazards and the potential for groundwater contamination. Rainfall frequently contains a variety of agricultural pesticides: a 1995 U.S. Geologic Survey of urban and agricultural sites found detectable levels of multiple pesticides in every sample. Foods may be contaminated with pesticide residues above acceptable food safety limits. Imported food may be contaminated with undue pesticide residues including pesticides banned domestically (such as DDT).

Credit Goals

- Obtain at least 25% of combined food and beverage purchases from any combination of the following sources:
  - USDA certified organic
  - Food Alliance Certified
  - Rainforest Alliance Certified
  - Protected Harvest
  - Fair Trade Certified

  AND/OR
  - local farms within a 100 mile radius of the facility.

Documentation

q Verify through purchasing records that at least 25% of combined food and beverage purchases, based on total dollars expended, meet the requirements of:

- Organic certification through USDA, the State of California or the certifying entity of another governmental body or through any of the following third party certification systems: Food Alliance certified, Rain Forest Alliance certified, Protected Harvest, or Fair Trade certified.

  AND/OR
- Local farm sourcing (within 100 mile radius of facility).

Reference Standards

The United States Department of Agriculture oversees the National Organic Standards Program http://www.ams.usda.gov/nop/Consumers/Consumerhome.html.

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EP Credit 1.1 continued

Food: Organic or Sustainable

Food Alliance is a third party certifier of sustainable agricultural practices and products. Before certification is granted, farms and ranches must meet a strict set of environmental and social criteria covering soil and water conservation, wildlife habitat, pesticide reduction and/or elimination, safe and fair labor conditions and animal welfare.
http://www.foodalliance.org/certification/FACertification.htm

Fair trade is a dynamic, alternate economic model that strives to protect the market over the long term including the self reliance of small-scale farmers and protecting vital eco-systems throughout the developing world thereby strengthening rural communities.
http://www.transfairusa.org/content/about/overview.php

Protected Harvest is an integrated pest management program. The pest management guidelines developed by the collaboration include guidelines in the following areas: field scouting, information management, pest management decisions, field management decisions, weed management, insect management, disease management, soil and water quality, and storage management. Pesticide toxicity is also assessed quantitatively and is based on specific pesticide use. Certain pesticides are explicitly prohibited from use. Protected Harvest has an explicit policy prohibiting the use of genetic engineering. http://www.protectedharvest.org/

Under the auspices of the Sustainable Agriculture Network (SAN), the Rainforest Alliance and partner organizations work with farmers to bring their operations up to standards for protecting wildlife, wild lands, workers' rights and local communities.
http://www.rainforest-alliance.org/programs/agriculture/certification/index.html

Potential Technologies & Strategies

Many smaller local farm sources will not have the resources or will not have completed the transition to obtain state or USDA organic certification but subscribe to sustainable agriculture practices and deserve support. Sustainable agriculture is plant and food animal cultivation that is healthful and humane, economically viable, environmentally sound, and socially just. There is no single definition for sustainable agriculture, but such a system has certain characteristics, including:

- Conservation and preservation: The use of land and other natural resources does not deplete their existence and therefore makes those resources available to future generations. Chemicals in agriculture are not conducive to sustainability, and therefore should be used minimally and only when necessary. Conservation in agriculture includes soil conservation, water conservation and protection, and energy conservation during the production process.
- Animal welfare: Sustainably raised animals are treated humanely and with respect, and are well cared for. They are permitted to carry out their natural behaviors, such as grazing, rooting or pecking, and are provided with a natural diet appropriate for their species.
- Biodiversity: Rotation of a variety of plant and animal types can enrich the soils nutrients, prevent disease, and minimize pest outbreaks, whereas continued support of a single species depletes those resources used by that species alone. Renewal of the ecosystem is an integral part of sustainability.

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EP Credit 1.1 continued

Food**: Organic or Sustainable**

- Economic viability: In a sustainable agricultural system, farmers earn fair prices for their products that are appropriate to their reasonable costs. A sustainable system does not depend on subsidies, because workers are treated fairly, and paid wages and benefits that allow them to continue their work.

Strive to support local farmers first. Participate in local Community Supported Agriculture (CSA) farming programs or other regional food distribution initiatives, if applicable to your region. Encourage local food suppliers and vendors to increase availability of organically grown food products.

Resources

The Organic Trade Association (OTA) is the membership-based business association for the organic industry in North America. OTA's mission is to encourage global sustainability through promoting and protecting the growth of diverse organic trade, http://www.ota.com/index.html.

The Eat Well Guide is designed to help consumers locate sustainably raised meats, eggs, and dairy in their local area, or by online order if there are few local options, http://www.eatwellguide.org/index.cfm.

National Rural Catholic Conference on the Ethics of Eating, http://www.ncrlc.com/.

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1 point

EP Credit 1.2

Food: **Antibiotics**

Intent

Support sustainable food production and improved environmental health through purchase of organic, drug free and locally produced food products.

Health Issues

Widespread use of antibiotics in meat production is raising concerns of antibiotic pass unchanged into animal waste. Meat can and does become contaminated during slaughter and meat processing. Often spread onto fields or sold as fertilizer, manure can contaminate surface or groundwater with antibiotic-resistant bacteria. The air from livestock barns using antibiotic feeds can contain several times the concentration of antibiotic resistant bacteria as do other livestock facilities. Widespread use of pesticides is threatening ecological health. Increased demand for organic foods and adoption of sustainable agricultural practices lessens these burdens.

Credit Goals

- Establish a meat procurement purchasing policy that includes the following requirements:
  - Regularly and consistently inform suppliers of meat, poultry, dairy, and seafood products of the preference for purchasing products that have been produced without non-therapeutic use of antibiotics, particularly those that belong to classes of compounds approved for use in human medicine. Procure a minimum of 50% of the total volume of such purchasing in compliance with this requirement.
  - Chicken: Unless these products are not available to the institution because of local supply constraints, chicken will only be purchased if it has been produced without the non-therapeutic use of antibiotics that belong to classes of compounds approved for use in human medicine; and without any use of fluoroquinolone antibiotics.
  - Poultry other than chicken will receive a purchase preference if it has been produced without the non-therapeutic use of antibiotics, particularly those that belong to classes of compounds approved for use in human medicine.

Documentation

q Verify through purchasing records that at least 25% of combined food and beverage purchases, based on total dollars expended, meet the requirements of:

- Organic certification through USDA, the State of California or the certifying entity of another governmental body or through any of the following third party certification systems: Food Alliance certified, Rain Forest Alliance certified, Protected Harvest, or Fair Trade certified.

  AND/OR

- Local farm sourcing (within 100 mile radius of facility).

q Verify through purchasing records that at least 50% of meat, poultry, dairy and seafood purchases, based on total dollars expended, meet the antibiotics requirements.

Reference Standards

There are no reference standards for this credit..

EP Credit 1.2 continued

Food: Antibiotics

Potential Technologies & Strategies

Enlist support from your medical and infection-control staff. Medical staff and infection control professionals appreciate the threat of drug resistant disease. However, many are unaware that antibiotic overuse in agriculture can contributes to the development of resistance. Discuss amending your facility's antibiotic use guidance policy to include guidance on food service procurement as it relates to antibiotic use in agriculture.

Work with your Group Purchasing Organization (GPO) – Participate in facility GPO's selection process for food vendors. Let your contacts there know that you are interested purchasing such products through them. Inform them that poultry is available without a price premium. If you are willing to pay a price premium for other meats, make sure you communicate that to them also.

Resources

Interagency Task Force on Antimicrobial Resistance. A Public Health Action Plan to Combat Antimicrobial Resistance. p. 9, www.cdc.gov/drugresistance/actionplan/aractionplan.pdf,

Environmental Defense, 2001. When Wonder Drugs Don't Work: How Antibiotic Resistance Threatens Children, Seniors, and the Medically Vulnerable. Washington, DC: Environmental Defense, http://www.environmentaldefense.org/documents/162_abrreport.pdf.

Centers for Disease Control (CDC). Background on Antibiotic Resistance. Atlanta, GA, www.cdc.gov/drugresistance/community.

Infectious Diseases Society of America (2003). Backgrounder: Bad Bugs, No Drugs - Defining the Antimicrobial Availability Problem,"
http://www.idsociety.org/Template.cfm?Section=Home&CONTENTID=7455&TEMPLATE=/ContentManagement/ContentDisplay.cfm.

Joint WHO/FAO/OIE Expert Workshop on Non-human Antimicrobial Usage and Antimicrobial Resistance, Geneva, 1 – 5 December 2003, Executive Summary,
http://www.who.int/foodsafety/micro/meetings/nov2003/en/.

1 point

EP Credit 1.3

Food: **Local Production/ Food Security**

Intent

Support sustainable food production and improved environmental health through purchase of organic, drug free and locally produced food products.

Health Issues

Local food production reduces the fuel consumption and accompanying emissions associated with long distance transport. Large centralized farms tend to increase unhealthy practices such as large feedlots and more intensive large scale mono-cropping that increase air and runoff water pollution. Conventional food production is pesticide intensive resulting in occupational hazards and the potential for groundwater contamination. Rainfall frequently contains a variety of agricultural pesticides: a 1995 U.S. Geologic Survey of urban and agricultural sites found detectable levels of multiple pesticides in every sample. Foods may be contaminated with pesticide residues above acceptable food safety limits. Imported food may be contaminated with undue pesticide residues including pesticides banned domestically (such as DDT).

Credit Goals

Farmers Markets

Host and promote on-site farmers market during growing season(s)

OR

Support and promote local farmers market during growing season.

OR

Farmers-Consumer Links

Provide access and support of direct farmer-to-consumer link, such as Community Supported Agriculture and/or food box program to patients, with a priority on low income population.

OR

Farms and Gardens

Support on-site food producing garden and/or urban food producing garden programs that are accessible to the public.

Documentation

- Document relationship with community-based farming and/or marketing initiatives.

Potential Technologies & Strategies

Fresh, nutritious food is available at farmers markets across the United States. Farmers' food box programs, where farmers drop off a weekly food supply, allow access to nutritious food. Potential drop off sites include child care centers, and/or local schools or other sites where families regularly visit.

In many urban areas, vacant lots are converted into urban gardens. Studies have shown that urban gardens have a measurable impact on nutrition and that access to community gardens is an important strategy for improving vegetable consumption.

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EP Credit 1.3 continued

Food: **Local Production/ Food Security**

Resources

Community Food Security Coalition
http://www.foodsecurity.org/

Ripe for Change: Rethinking California's Food Economy addresses the root causes of breakdown in the food economy and points to solutions and case studies of how an alternative vision can work
http://www.isec.org.uk/ripeforchangepage.html

The primary focus of the U.S. Department of Agriculture's nutrition assistance programs is providing food security http://www.fns.usda.gov/fsec/

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1 point

EP Credit 2

Janitorial Paper & Other Disposable Products

Intent

Reduce use of virgin paper resources in janitorial paper and other disposable product applications.

Health Issues

Each year, US commercial and institutional users consume 4.5 billion pounds of janitorial paper and 35 billion plastic trash liners. Paper products with high recycled content reduce sulfur and greenhouse gas emissions during manufacture, conserve virgin forest resources and contribute to healthier forest ecosystems.

Credit Goals

- Develop and maintain an environmentally preferable janitorial paper and other disposable product policy, addressing the following:
  - Use disposable janitorial paper products and trash bags that meet the most current Comprehensive Procurement Guidelines (CPG) for recycled content. The following recycled requirements were accurate at the time of printing:

Toilet tissue	20% minimum Post Consumer content
Paper hand towels	40% minimum Post Consumer content
Industrial wipes	40% minimum Post Consumer content
Facial tissues	10% minimum Post Consumer content
Plastic trash liners	10% minimum Post Consumer content

  - Give preference to paper products that are manufactured Process Chlorine-Free.
  - Use large rolls wherever possible, and hands-free dispensers that limit paper portions. Do not use C-fold or multi-fold paper towel systems.

Documentation

q Maintain a copy of the environmentally preferable disposable product purchasing policy.

q Document that the policy has been followed in purchasing and procurement of supplies.

Reference Standards

EPA Comprehensive Procurement Guidelines, www.epa.gov/cpg/products.htm.

Potential Technologies & Strategies

Purchase janitorial products with high post consumer recycled content. Wherever possible, install roll type dispensers to limit quantities of paper products used.

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1 point

EP Credit 3

Electronics Purchasing & Take Back

Intent

Require take back and management services for end of life electronic products to safely manage hazardous compounds.

Health Issues

Computers and other electronic wastes contain highly hazardous compounds and/or metals. Due to the increased sales and shorter life spans of IT equipment, electronic waste has become one of the world's fastest growing waste streams. The average electronic product contains hazardous materials including: chlorinated plastics in cable wiring, brominated flame retardants in circuit boards, heavy metals like lead and cadmium in Cathode Ray Tube (CRT) monitors, mercury in Liquid Crystal Display (LCD) or flat panel monitors.

IT equipment contains chemicals that are known or probable teratogens, persistent bioaccumulative substances, carcinogens, reproductive toxicants, endocrine disruptors, and mutagens. Less than ten percent of discarded computers are currently recycled, with the remainder stockpiled or improperly disposed of in landfills or incinerators or illegally exported to developing countries for disassembly under unsafe conditions. As a result, the toxic substances can be released into air, ground and water directly exposing recycling workers and threatening the global public and ecological health.

Credit Goals

- Establish an IT Assets Management Team with staff from IT, Environmental Services/ Recycling, Procurement, Administration and Risk Officers.
- Develop an IT-Environmental management plan. The IT-Environmental management plan should include strategies around Procurement, Reduction, Responsible Reuse, and Responsible Recycling.
- Each of these strategies should be in compliance with federal and state solid waste and hazardous waste disposal regulations, including Universal Waste Rules, and include:
  - Manufacturers' written commitments of equipment take-back at end of product life.
  - Verification that only those recyclers that have signed the Recycler's Pledge of Environmental Stewardship, and verified that they do not export hazardous waste shall be contracted with.
  - A HIPAA compliance plan for electronic products.

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EP Credit 3 continued

Electronics Purchasing & Take Back

Documentation

- **q** Document the Electronics Purchasing and Take Back requirements, and periodically review for continued compliance with the requirements.

Potential Technologies & Strategies

Seek product take-back for electronic assets at the end of their useful life at the time of signing new contracts with equipment manufacturers. Contract only with recyclers that have signed the Recycler's Pledge of Environmental Stewardship, and that provide adequate documentation proving they do not landfill, incinerate or export e-waste. Contract for new equipment by seeking manufacturers that have demonstrated product improvement on key environmental and health attributes related to both, the product and the manufacturing facility and for products that have upgradeability options enabling the equipment can have longer use value without being replaced.

Reference Standards

Health Care Without Harm's Procurement Guidelines:
http://www.noharm.org/details.cfm?ID=878&type=document.

For vendors that have signed the Recycler's Pledge, visit:
http://www.ban.org/pledge/Locations.html.

For more information on end-of-life choices for electronic equipment, refer to Hospitals for a Healthy Environment's document: *Healthier Choices for Electronic Equipment: From Procurement to End-of-Life*,
http://www.h2e-online.org/tools/uniwast.htm.

For information on environmentally responsible recyclers: http://www.ban.org/pledge1.html.

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1 point

EP Credit 4.1

Toxic Reduction: **Mercury**

Intent

Eliminate stand-alone mercury-containing medical devices and eliminate mercury discharge through product substitution and capture.

Health Issues

In 1998, a Memorandum of Understanding between the American Hospital Association and the US EPA set new goals for hospital pollution prevention. One of the top priorities was the virtual elimination of mercury and mercury-containing devices from the hospital waste stream by the year 2005. Mercury is a potent neurotoxin. The most sensitive health effect of mercury is an adverse impact on the neurological development of fetuses, infants and children. Low-level prenatal exposure can result in language, memory and attention deficits in children who were exposed in utero. Hospitals have substantially reduced the purchase of mercury containing chemicals and medical devices and found substitutes for many pharmaceuticals. To achieve virtual elimination of mercury from the waste stream, however, requires the phasing out and recycling of mercury containing building products, such as thermostats, switches, batteries, and lamps, for mercury recovery.

Requirements

- Develop a mercury-free policy.
- Obtain low mercury fluorescent tubes and compact fluorescent lamps, and low mercury high intensity discharge bulbs such that average mercury content in fluorescent tubes and compact fluorescent lamps does not exceed 5 mg of mercury, and that high-intensity discharge lamps have the lowest available mercury content, providing that all other performance specifications are met.
- Eliminate specification and use of barometers, medical devices, and other stand-alone mercury containing medical equipment.
- Obtain mercury free MRI equipment, wheel chairs, automated beds and other medical and laboratory equipment.
- Collection and disposal of any mercury devices shall be designated for recycling and preclude overseas donation/disposal.
- Develop a mercury spill protocol, and hold recaptured mercury for safe disposal.

Documentation

- q Document that the facility is free of mercury containing devices (excepting bulbs and any devices mandated by Federal law), and that any dental facilities have installed amalgam separators that meet or exceed the standard ISO-11143.
- q Prepare and adopt an organizational policy specifying that all future purchases of mercury-containing light bulbs willb e made in such a way that the average mercury content of the light bulbs is less than the specified level in picograms/lumen hour.
- q Document all acquisitions during the performance period of mercury-containing light bulbs for use in the building and grounds.

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EP Credit 4.1 continued

Toxic Reduction: **Mercury**

- q Include manufacturer Material Safety Data Sheets (MSDS) for each type of mercury-containing light bulb purchased showing mercury content of the light bulbs in milligrams.
- q Compile a copy of the Waste Management Plan highlighting the types of mercury containing devices in use that are handled by the recycling program and disposal methods for captured mercury. Include dental wastes, including scrap amalgam, chairside traps, and separator wastes.
- q Maintain purchasing records and technical data on lamps verifying that the average mercury concentration for all fluorescent tubes and compact fluorescent bulbs is no more than 5 mg.
- q Verify that high-intensity discharge lamps are purchased with the lowest mercury content, providing that all other performance specifications are met.

Reference Standards

The American Hospital Association (AHA) and the United States Environmental Protection Agency (EPA) signed a Memorandum of Understanding identifying goals to reduce the impact of health care facilities on the environment. A primary goal included the virtual elimination of mercury waste from the health care waste stream by the year 2005.
http://www.h2e-online.org/about/mou.htm.

A variety of state laws prohibiting some or all uses of mercury containing medical devices and/or mercury switches have been enacted into law. These include but are not limited to:

- Maine *State law (LD 1159)* that prohibits the sale of mercury in switches, measuring devices (including sphygmomanometers), instruments and thermostats.
- Washington *State law (House Bill 1002)* that requires the labeling of fluorescent lamps that contain mercury. Prohibits the sale of mercury-containing items in products such as thermometers, and thermostats. Sphygmomanometers may not be sold with the exception of a hospital or health care facility with a mercury reduction plan in place.
- Michigan *State law (House Bill 4599)* that bans the sale of mercury thermometers.
- Connecticut *State law (House Bill 5539)* that bans the sale and distribution of mercury fever thermometers and places restrictions on the sale of other mercury-containing equipment.
- Massachusetts *State law (House Bill 3772)* that bans the sale of mercury fever thermometers.
- California *State law (SB 633)* that restricts the use and distribution of mercury fever thermometers and other uses.
- Oregon *State law (HB 3007)* that phases out mercury thermostats and prohibits the sale of fever thermometers and other uses.

EP Credit 4.1 continued

Toxic Reduction: **Mercury**

Potential Technologies & Strategies

Develop a facility wide policy to guide removal and substitution of all mercury containing medical equipment and devices. Conduct community wide thermometer exchanges to encourage the public to return mercury containing devices for proper disposal and replacement with digital alternatives.

Purchase low mercury fluorescent lamps. Advances in lighting technology have greatly reduced the per bulb mercury concentrations. Low mercury, high intensity discharge lamps are increasingly available. Consider long life bulbs to reduce costs associated with relamping, recycling and purchase. Very low mercury fluorescent induction lighting, with instant on–off control, offering reduced energy usage and long life should be considered.

Stay abreast of lighting technology advances noting the development of LED technologies as substitutes for fluorescent.

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1 point

EP Credit 4.2

Toxic Reduction: **Di Ethyl Hexyl Phthalate (DEHP)**

Intent

Reduce and limit the exposure of patients, staff and visitors to DEHP from clinical products plasticized with DEHP.

Health Issues

DEHP is a reproductive toxicant. Under California's Proposition 65 law, DEHP containing products will be required to be labeled as containing a reproductive toxicant. In the United States, the Food and Drug Administration has issued an FDA Safety Assessment and a Public Health Notification urging health care providers to use alternatives to DEHP-containing devices for vulnerable patients. That advisory is consistent with findings issued in a report by the Center for the Evaluation of Risks to Human Reproduction of the National Toxicology Program. In Canada, an expert advisory panel to Health Canada has recommended that health care providers not use DEHP containing devices in the treatment of pregnant women, breastfeeding mothers, infants, males before puberty and patients undergoing cardiac bypass hemodialysis or heart transplant surgery. Phthalates such as DEHP have been measured in virtually all fresh water and marine environments, including Antarctic pack ice.

Credit Goals

- DEHP is used extensively as a plasticizer in PVC containing products. Facilities shall develop a DEHP elimination plan. The plan shall require:
  - Audit and identify use areas of flexible PVC (or vinyl) plasticized with DEHP. Tubing, IV and blood bags are the primary end uses for disposable PVC medical products.
  - Develop a DEHP-free implementation plan, including timelines for phaseout for procedures identified by the FDA as high risk.
  - According to the FDA these highest risk procedures are total parenteral nutrition in neonates (with lipids in PVC bag), enteral nutrition in neonates and adults, multiple procedures in sick neonates (high cumulative exposure), hemodialysis in peripubertal males or pregnant or lactating women, exchange transfusion in neonates, heart transplantation or coronary artery bypass graft surgery (aggregate dose), massive infusion of blood into trauma patient, extracorporeal membrane oxygenation (ECMO) in neonates, transfusion in adults undergoing ECMO.
- The Purchasing Department and/or Group Purchasing Organization require manufacturers to label DEHP containing products.
- A purchasing policy that gives preference to DEHP-free clinical and other products.

Documentation

q Prepare the DEHP Elimination Plan, Audit, and Phaseout Plan as required.

EP Credit 4.2 continued

Toxic Reduction: **Di Ethyl Hexyl Phthalate (DEHP)**

Potential Technologies & Strategies

Perform a PVC/DEHP audit. Health Care Without Harm has developed a *PVC/DEHP Audit Tool* to aid in this process.

Require product acquisition teams/purchasing staff to assess products for DEHP content.

Reference Standards

United States Food and Drug Administration: http://www.fda.gov/.

Health Canada: http://www.hc-sc.gc.ca/hpfb-dgpsa/tpd-dpt/eap-dehp-final-report-2002-jan-11_e.html.

State of California's Proposition 65, the Safe Drinking Water and Toxic Enforcement Act of 1986, http://www.oehha.ca.gov/prop65/law/P65law72003.html.

Office of Environmental Health Hazard Assessment, http://www.oehha.ca.gov/prop65.html.

The National Toxicology Program (NTP) Center for the Evaluation of Risks to Human Reproduction (CERHR), http://cerhr.niehs.nih.gov/.

Case studies of facilities that have eliminated DEHP containing medical devices, http://www.noharm.org/pvcDehp/reducingPVC#case.

1 point

EP Credit 4.3

Toxic Reduction: **Natural Rubber Latex**

Intent

Eliminate air contaminants and allergens emitted from medical supplies and devices and that release volatile organic compounds and other chemicals to ensure the health of building occupants and staff.

Health Issues

Natural rubber latex is a product manufactured from the milky fluid primarily derived from the rubber tree, *Hevea brasiliensis*. In 1997 the National Institute for Occupational Safety and Health (NIOSH) issued an alert indicating that exposure to natural rubber latex can lead to skin rashes; hives; flushing; itching; nasal, eye, or sinus symptoms; asthma; and (rarely) shock. They noted an increase in allergic reactions to latex, especially among health care workers. Children with spina bifida or urologic birth defects are particularly susceptible to latex allergies. Eliminating materials that emit chemicals recognized as irritants, allergens and/or asthma triggers minimizes building occupant exposure to conditions that may prompt and/or prolong an allergic or asthmatic condition.

Credit Goals

- Establish and implement a policy prohibiting the procurement and use of natural rubber latex surgical gloves, stethoscopes, blood pressure cuffs, intravenous tubing, syringes, tourniquets, endotracheal tubes, oral and nasal airways, balloons, and other products and materials containing natural rubber latex.
- Establish and implement a policy prohibiting the procurement and use of natural rubber latex in carpet backing.

Documentation

q Document policy limiting the procurement and use of natural rubber latex products into buildings.

q Document purchasing specifications excluding carpet backings with natural rubber latex.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Implement policies that provide for substitute products. Nitrile gloves are effective substitutes for natural latex products. Mylar balloons in lieu of latex balloons are increasingly commonplace.

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1 point

EP Credit 5

Furniture & Medical Furnishings

Intent

Reduce the environmental and health burdens associated with the manufacture, use and disposal of furniture and medical furnishings products.

Health Issues

The environmental and health issues surrounding materials used in the manufacture of furniture products parallel those outlined for building products in the Material and Resource credits. Significant health impacts are associated with the use of persistent, bioaccumulative and toxic chemicals (PBTs), chrome plated finishes, and wood harvesting for furniture products manufacture.

PBTs are toxic chemicals of particular health concern because they do not break down quickly in the environment, they become widely distributed geographically and they bio-magnify or concentrate in the tissue of living organisms as they move up the food chain. With a few exceptions, the major source of human exposures to PBTs in the general population occurs from the consumption of contaminated food in the ordinary diet. These toxic chemicals cause a range of adverse wildlife and human health effects, including cancer, and developmental impacts in the nervous, reproductive, and immune systems, Immature, developing organisms are the most sensitive to exposures to PBTs.

The furniture industry is a major market for wood products. Human and environmental health is inextricably linked with forest health. Sustainable forestry protects water quality by reducing water and soil runoff and pesticide and herbicide use. Specifying and procuring certified sustainably harvested wood increases acreage using sustainable management practices. These practices also protect aquatic life, including threatened and endangered species, and maintain viable diverse plant life increasing air filtration and carbon dioxide sequestration. The balancing of carbon dioxide mitigates global climate change, and thereby reduces the spread and redistribution of disease that can be a consequence of climate change.

Credit Goals

- Obtain 40% of annual volume of furniture and medical furnishings, based on cost, that complies with the Credit Goals of Construction: MR Credit 9.1-9.3 Furniture and Medical Furnishings.

Documentation

q Prepare a matrix indicating the three Credit Goals and a listing of furniture, indicating that the requisite amount of furniture complies with the Credit Goals of MR Credits 9.1-9.3.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Refer to Construction: MR Credits 9.1-9.3.

2 points

EP Credit 6

IAQ Compliant Products

Intent

Enhance building indoor air quality (IAQ) through procurement and implementation of low-emitting products and processes.

Health Issues

Volatile organic compound emissions (VOCs) from adhesives and sealants, paints, and carpet backing contribute to lowering indoor and outdoor air quality and negatively affecting human health. These VOCs and the carcinogens and reproductive toxicants addressed by this credit represent a serious health risk to both the installers and the building occupants. The at-risk populations in a health care system with impaired immune, respiratory, and neurological systems are particularly vulnerable to poor indoor environmental conditions, as are children, pregnant women, the elderly, and those with allergies, asthma or chemical sensitivities.

Formaldehyde (HCHO) emissions from casework and other engineered wood and agrifiber products contribute to diminished indoor and outdoor air quality, negatively affecting human health. Formaldehyde is listed by the U.S. EPA as a probable human carcinogen, and by the National Institute for Occupational Safety as a workplace carcinogen.

Credit Goals

Optimize use of air quality compliant materials inside the building to improve the building's emission profile. Points are awarded for the existence of sustainable product purchasing policies for the building and site addressing these requirements, and documentation of purchasing during the performance period in conformance with those policies, as described below. Subsequent re-certification is tied to both polices and purchasing performance, as described below. At a minimum, these policies must include the following product groups: paints and coatings, adhesives, sealants, carpet, composite panels, agrifiber products and building materials used inside the building. The building materials covered include any building materials used for improvements, including upgrades, retrofits, renovations or modifications, inside the building.

Calculate the percentage of the total sustainable material and product purchases (on a cost basis that meet the following IAQ compliance criteria:

- Adhesives and sealants with a VOC content that complies with Construction: EQ Credit 4.1 Credit Goals.

OR

- Paints and coatings with VOC emissions that do not exceed the VOC and chemical component limits of Green Seal's Standard GS-11 requirements and complies with Construction: EQ Credit 4.2 Credit Goals

OR

- Carpet that meets the Credit Goals of Construction: EQ Credit 4.3

OR

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EP Credit 5 continued

IAQ Compliant Products

- Composite panels, agrifiber products and insulation that contain no added urea-formaldehyde resins and comply with Credit Goals of Construction: EQ Credit 4.4.

Credit 6.1	Purchase IAQ compliant for 45% of annual purchases (1 point)
Credit 6.2	Purchase IAQ compliant for 90% (1 point in addition to 6.1)

Documentation

- Provide a copy of the organizational policy that specifies use of sustainability criteria for purchases of covered materials for use in the building.
- Provide documentation of all covered materials purchased and total cost of these purchases over the performance period.
- Provide documentation of all covered materials purchases that meet one or more of the specified sustainability criteria and the cost of these purchases over the performance period.
- Provide a calculation of the fraction of covered materials purchased that meet one or more of the specified sustainability criteria (on a cost basis).

Reference Standards

Refer to Reference Standards in applicable Construction credits.

Potential Technologies & Strategies

When purchasing materials, supplies or equipment, specify that these must meet one or more of the specified sustainability criteria.

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Innovation in Operations

4 points

IN Credit 1

Innovation in Operations

Intent

To provide project teams and projects the opportunity to achieve points for exceptional performance above requirements set by the *Green Guide for Health Care: Operations* and/or innovative performance for Green operations strategies not specifically addressed by the *Green Guide for Health Care*.

Health Issues

The health care industry's environmental footprint is continuously evolving, as are responses to environmental stewardship and responsibility. The health care industry is uniquely positioned to evolve ever more powerful and innovative strategies to enhance building performance. These credits are intended to reward exemplary performance of existing credits and encourage implementation of innovative operations programs and ideas.

Credit Goals

Credit 1.1 (1 point)	Identify the **intent** of the proposed innovation credit, the proposed **requirement** for compliance, the proposed **documentation** to demonstrate compliance, and the **operational approach** used to meet the required elements.
Credit 1.2 (1 point)	Same as Credit 1.1.
Credit 1.3 (1 point)	Same as Credit 1.1.
Credit 1.4 (1 point)	Same as Credit 1.1.

Documentation

q Prepare the proposal(s) (including intent, requirement, documentation and operations approach) and relevant evidence of performance achieved.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Substantially exceed a *Green Guide* credit threshold such as for energy performance or waste management. Apply strategies or measures that are not covered by the *Green Guide* such as programs that return to procurement of reusable materials, special environmental educational programs (for example, "Garbage free lunch"), or community environmental programs (such as mercury thermometer exchanges).

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1 point

IN Credit 2

Documenting Sustainable Operations Business Case Impacts

Intent

Document sustainable building cost impacts.

Health Issues

Building a business case for sustainable design includes recognition of impact on operations. Impacts may be quantified in terms of monetary savings or avoided pollution. Making the business case reinforces the economic viability of adoption and implementation of sustainable operations policies and programs.

Credit Goals

- Document overall building operating costs for the previous five years (or length of building occupancy, if shorter), and track changes in overall building operating costs over the performance period. Document building operating cost and financial impacts of all of the aspects of *Green Guide* implementation on an ongoing basis.

Documentation

q Compile all building operating costs for the previous five years (or length of building occupancy, if shorter).

q Track changes in overall building operating costs over the performance period relative to sustainable performance improvement initiatives implemented and maintained for the building and the site.

q Track building operating cost and the financial impacts in building operation covering all aspects of *Green Guide* implementation on an ongoing basis.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Track building operating costs to identify positive impacts relative to sustainable performance improvements to building and operations.

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1 point **IN Credit 3.1**

Documenting Productivity Impacts: **Absenteeism & Health Care Cost Impacts**

Intent

Document absenteeism, health care cost and productivity impacts of sustainable building performance improvements.

Health Issues

There has been little data on Productivity Impacts related to sustainable buildings in health care. Studies on commercial office buildings have shown that workers in environments with improved indoor air quality, occupant control of ventilation and lighting, and access to nature have a reduction in illness/ absenteeism and increased productivity.

Credit Goals

- Document the history of absenteeism and health care costs for building occupants for the previous five years (or length of building occupancy with a minimum of 12 months) and track changes in absenteeism and health care costs (claim costs must be provided and any reductions in premium costs should be provided if available) for building occupants over the performance period relative to sustainable building performance improvements.

Documentation

- q Document the history of absenteeism and health care costs for building occupants for the previous five years (or length of building occupancy with a minimum of 12 months).
- q Track changes in absenteeism and health care costs (claim costs must be provided and any reductions in premium costs should be provided if available) for building occupants over the performance period relative to sustainable building performance improvements.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Track absenteeism and health care costs for building occupants to identify positive impacts relative to sustainable performance improvements to building IEQ and operations.

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1 point

IN Credit 3.2

Documenting Productivity Impacts: **Other Productivity Impacts**

Intent

Document other productivity impacts of sustainable building performance improvements.

Health Issues

There has been little data on Productivity Impacts related to sustainable buildings in health care. Studies on commercial office buildings have shown that workers in environments with improved indoor air quality, occupant control of ventilation and lighting, and access to nature have a reduction in illness/ absenteeism, and increased productivity.

Credit Goals

- Document other productivity impacts (beyond health impacts outlined in IO Credit 3.1) of sustainable building performance improvements for building occupants. Address and track changes in staff recruitment, satisfaction or retention, clinical performance measures (medical errors, for example) for building occupants over the performance period relative to sustainable building performance improvements, for a minimum of 12 months.

Documentation

q Document other productivity impacts for building occupants (beyond those identified in IO Credit 3.1) of sustainable building performance improvements. The documentation needs to address the impact on staff recruitment, satisfaction, retention or designated clinical performance measures for building occupants relative to sustainable building performance improvements, for a minimum of 12 months.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Set up a system to track changes in the impacts in productivity by building occupants over the performance period relative to sustainable building performance improvements (beyond those identified in IN 3.1).

State of New Jersey
istine Todd Whitman
ernor
Department of Environmental Protection
Division of Solid and Hazardous Waste
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Robert C. Shinn, Jr.
Commissioner

Position on Satellite Accumulation

*Revisions found in ***Bold Bracked Italics*** under Application Section

Effective Date: FEB 28 1996 Approval:

NJ Application Rule [citations]: N.J.A.C. 7:26-9.3(d)-**Accumulation of hazardous waste . . . . . (Commonly known as Satellite Accumulation)**
N.J.A.C. 7:26-7.2-**Container requirements**
N.J.A.C. 7:26-9.4(d)-**General facility standards (Commonly known as Management of containers)**

Federal Rule Equivalent [citations]: 40 CFR 262.34(c)-**Accumulation Time (Satellite Accumulation)**
40 CFR 265.170-**Use and Management of Containers**
U.S.E.P.A. - Office of Solid Waste
Satellite Accumulation - 1989 Memo and regulatory response

1) Purpose:
The present purpose of this paper is to improve and clarify the hazardous waste management procedures for generators who may have satellite accumulation areas.

2) Basis and background:
A satellite accumulation area is defined by the United States Environmental Protection Agency (USEPA) and the New Jersey Department of Environmental Protection (NJDEP) as an area at or near any point of generation where hazardous waste initially accumulates, and is under the control of the operator of the process generating the waste. [Attachment A - USEPA Regulatory Response]. These satellite accumulation areas do not have to be permitted nor comply with N.J.A.C. 7:26-9.3(a) (i.e. 90 day accumulation requirements) provided that they meet the following requirements set forth at N.J.A.C. 7:26-9.3(d):

1. The quantity of waste in each accumulation area is less than 55 gallons of hazardous waste or less than one quart of acutely hazardous waste listed in N.J.A.C. 7:26-8.15(a)5;
2. The waste is placed in containers which meet the standards of N.J.A.C. 7:26-7.2 and are managed in accordance with N.J.A.C. 7:26-9.4(d)2, 9.4(d)3, 9.4(d)4i;
3. The accumulation area is at or near any point of generation where wastes initially accumulate in a process, which is under the control of the operator of the process generating the waste;
4. The generator marks the containers with the words "Hazardous Waste";
5. The generator marks the container with the date that the quantity of waste reaches the volume indicated in (d)1 above; and

6. Within three days after the quantity of waste reaches the volume identified in (d)1 above, the generator complies with one of the following:

i. Places the container in an accumulation area in accordance with N.J.A.C. 7:26-9.3(a); or

ii. Places the container in an on-site authorized facility, as defined at N.J.A.C. 7:26-1.4;

iii. Transports the container to an off-site authorized commercial hazardous waste facility in accordance with N.J.A.C. 7:26-7.

During the accumulation period, it is important to know that both State and Federal regulations describe the type of containers used and how these containers are managed. [Attachment B - USEPA Memo]. Accordingly, the waste must first be placed in containers which meet the standards under N.J.A.C. 7:26-7.2; and secondly, the waste must be managed in accordance with the specific sections of N.J.A.C. 7:26-9.4(d) outlined below:

- If a container holding hazardous waste is not in good condition, or if it begins to leak, the owner or operator shall transfer the hazardous waste from the container to a container that is in good condition, or manage the waste in some other way that complies with the requirements under this section. [N.J.A.C. 7:26-9.4(d)2]

- The owner or operator shall use a container made of or lined with materials which will not react with, and are otherwise compatible with the hazardous waste to be stored, so that the ability of the container to contain the waste is not impaired. [N.J.A.C. 7:26-9.4(d)3]

- Management of the containers shall conform to the following requirement:
  The container shall be securely closed so that there is no escape of hazardous waste nor its vapors, except during filling or emptying. [N.J.A.C. 7:26-9.4(d)4i]

3) <u>Intent:</u>
N.J.A.C. 7:26-9.3(d) is intended to relieve generators of the burden of documentary requirements (i.e. contingency plans, personnel training plans and preparedness and prevention arrangements) for on-site locations where wastes are initially generated and accumulated in a satellite area. In addition to this benefit, generators also have an indefinite time period to accumulate up to 55 gallons of hazardous waste or 1 quart of acutely hazardous waste listed in N.J.A.C. 7:26-8.15(a)5 in these satellite areas; and therefore, allows any generator who is subject to full regulation to accumulate a full container prior to further management. It is important to note that a small quantity generator (SQG) may go in and out of the regulatory system by exceeding the SQG regulatory limits from time to time. When the SQG exceeds its regulatory limits, it looses its SQG status and becomes subject to full regulation. If this situation occurs, the generator may then take advantage of the satellite accumulation regulations.

4) <u>Application:</u>
The following is a list of regulatory applicability determinations that the NJDEP regulatory and enforcement divisions have made in the past and are currently being applied with respect to satellite accumulation:

- A satellite accumulation area will be limited to one "waste stream" or a combination of compatible waste streams. [Definition of a "waste stream": a material generated as a result of a distinct and limited process, procedure or activity.]

- *[When the total quantity of hazardous waste at a satellite accumulation area is <u>LESS THAN</u> the accumulation limit*, multiple partially-filled containers may be used at the same time.*
  **Accumulation limit = 55 gallons of hazardous waste or 1 quart of acutely hazardous waste.]*

- There is no limit on the total number of full containers allowed at a satellite accumulation area provided that, a). each full container is securely closed and has been marked with the date *[when "excess accumulation" began;]* and b). each container is removed from the area within three days *[of that date]*. *[Definition of "excess accumulation": when the satellite accumulation area limit has been exceeded]*.

- Notwithstanding the fact each satellite accumulation area is in control of an operator, an accumulation area ... " at or near the point of generation " ... provides no minimum distance requirement for separating any satellite accumulation area. Therefore, multiple satellite areas may be located in close proximity to one another.

- A generator may accumulate waste in a satellite accumulation area exclusively, without having a less than 90 day accumulation area or on-site authorized facility, provided each container is shipped off site within three days *[from the date "excess accumulation" begins]*.

- There is no time limit for the initial accumulation in satellite areas.

- A conveyance container (i.e. a laboratory safety can) may be used to move or convey waste from an initial generation point (i.e. a work station) to the actual satellite accumulation container. The conveyance container itself would not need to be managed in accordance with N.J.A.C. 7:26-9.3(d).

- *[Containers, such as beakers, flasks or other laboratory glassware including 4-liter bottles, that are connected to laboratory apparatus or a piece of equipment, are considered part of the process and <u>not</u> <u>subject</u> to accumulation rules and regulations.]*

5) <u>Position:</u>
New Jersey's position is that any generator who is subject to full regulation may accumulate less than 55 gallons of non-acutely hazardous waste or less than one quart of acutely hazardous waste in a satellite accumulation area at or near the point of generation provided that the area is in control of the operator. Within three days after the accumulation limit for any particular area has been reached, the waste must be removed and managed in compliance with N.J.A.C. 7:26-9.3(d)(6). Note: This position paper supersedes any decisions or positions that were printed in previous documents.

If you have any questions concerning New Jersey's position on this subject, please contact the Hazardous Waste Regulation Program at (609) 633-1418.

PR96(S1):sj
RLT:Revisions
Regulatory Policy Unit
Enclosures
2/26/96

January 05, 2001 / 49(51);1156-8

Nosocomial Poisoning Associated With Emergency Department Treatment of Organophosphate Toxicity --- Georgia, 2000

Emergency department (ED) staff caring for patients contaminated with toxic chemicals are at risk for developing toxicity from secondary contamination. This report describes three cases of occupational illnesses associated with organophosphate toxicity caused by exposure to a contaminated patient and underscores the importance of using personal protection equipment (PPE) and establishing and following decontamination procedures in EDs and other areas of acute care hospitals.

Patient 1

On April 11, a 40-year-old man intentionally ingested approximately 110 g of a veterinary insecticide concentrate. The insecticide contained 73% naphthalene, xylene, and surfactant, and 11.6% phosmet. On clinical examination at a local hospital ED approximately 20 minutes after the ingestion, the patient had profuse oral and bronchial secretions, vomiting, bronchospasm, and respiratory distress. He was intubated for airway management and ventilation. To control secretions, he received 4 g pralidoxime and 22 mg atropine during the next 24 hours. The patient improved over a 9-day period and was transferred to a psychiatric facility.

The patient was brought to the ED by a friend, not by emergency medical services, and the friend developed symptoms that required treatment. ED personnel exposed to the patient had symptoms within an hour of his arrival. The staff noted a chemical odor in the ED and contacted the regional poison center, which recommended decontaminating the patient's skin and placing gastric contents in a sealed container to minimize evaporation; however, no decontamination was performed.

Health-Care Worker 1

A 45-year-old ED nursing assistant providing care to patient 1 developed respiratory distress, profuse secretions, emesis, diaphoresis, and weakness. She had contact with the patient's skin, respiratory secretions, and emesis. She was admitted to the hospital and required intubation for 24 hours to support respiration. After medical management and serial doses of atropine and pralidoxime for 7 days, her respiratory function improved, and she was discharged after 9 days of hospitalization.

Health-Care Worker 2

A 32-year-old ED nurse had diaphoresis, confusion, hypersalivation, nausea, and abdominal cramps while caring for patient 1. Although she did not have skin contact with his secretions or emesis, she had shared his breathing space. After treatment with 10 mg of atropine and pralidoxime over the next 12 hours, her symptoms resolved.

Health-Care Worker 3

A 56-year-old nurse providing care for patient 1 was admitted to the hospital with dyspnea, confusion, and headache. Although she did not have skin contact with secretions or emesis from patient 1, she had shared his breathing space. She was given 6 mg of atropine without relief of the dyspnea. As a possible result of excessive atropine, she experienced hallucinations. On recommendation of the regional poison center, she received intravenous lorazepam and was observed until the episode resolved. She improved overnight and was discharged.

Reported by: RJ Geller, MD, KL Singleton, MD, ML Tarantino, Georgia Poison Center, Atlanta; CL Drenzek, DVM, KE Toomey, MD, State Epidemiologist, Georgia Div of Public Health. Div of Surveillance, Hazard Evaluations, and Field Studies, National Institute for Occupational Safety and Health; National Pharmaceutical Stockpile Br, Div of Emergency and Environmental Health Svcs; Div of Environmental Hazards and Health Effects; National Center for Environmental Health, CDC.

Editorial Note:

During the incident in this report, health-care workers were exposed to a patient contaminated with an organophosphate insecticide. These health-care workers were not wearing appropriate respiratory or skin protective equipment while caring for the patient. As a result, three health-care workers developed symptoms consistent with organophosphate intoxication and required treatment. This was the third episode reported during 2000 to the Georgia Poison Center of nosocomial poisoning of ED staff involved in the care of patients who had intentionally ingested a concentrated organophosphate mixed with xylene and other hydrocarbon solvents. Similar incidents have occurred elsewhere (*1*). During 1987--1998, the National Institute for Occupational Safety and Health identified 46 health-care workers who had acute pesticide-related illness after providing care to a pesticide-contaminated patient (G. Calvert, CDC, personal communication, 2000).

The Joint Commission on Accreditation of Healthcare Organizations requires hospitals to have a plan to manage contaminated patients (*2*); however, these recommendations do not include a plan to protect health-care workers caring for contaminated patients. During 1996--1998, surveys of hospitals in Georgia and at level 1 trauma centers nationally indicated that few acute care hospitals had trained staff, equipment, and procedures to safely care for contaminated patients (*3*--*5*).

Depending on the extent of the contamination, health-care workers caring for chemically contaminated patients should use level C protection (i.e., full face mask and powered/nonpowered canister/cartridge filtration respirator) or level B protection (i.e., supplied air respirator or self-contained breathing apparatus) (*6*). The type of canister/cartridge should be appropriate to the agent; if the agent cannot be identified, an organic vapor/HEPA filter is recommended (*6*). To prevent dermal absorption, chemical barrier protection appropriate to the contaminant is needed; latex medical gloves are of little protection against many chemicals. In addition to the need for surface decontamination of patients, body fluids also must be contained to prevent dermal and inhalational exposure. To limit distant spread of the contaminant, the EDs ventilation exhaust should be directed away from the hospital's main ventilation system.

EDs may have to care for persons contaminated with chemicals resulting from self-inflicted contamination, industrial incidents, and terrorist events (*7*). To protect health-care workers caring for these patients, EDs should adhere to existing guidelines (*6*,*8*,*9*) and decontamination protocols, train staff in the use of PPE, and maintain adequate quantities of antidotes (*10*). If sufficient quantities of antidote are not available, the National Pharmaceutical Stockpile at CDC maintains a mechanism to procure and deliver large quantities of pharmaceuticals to state health departments within 12 hours. Coordination among health-care facilities, poison centers, and state and local health departments could provide surveillance of a chemical agent release, facilitate the expeditious procurement of supplies from outside sources, protect health-care workers, and inform the public about contaminants.

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NYS DEPT. OF ENVIRONMENTAL CONSERVATION
FAX COVER SHEET

TO: Joel Golumbek

BUSINESS: EPA

☎ FAX: 212-637-4949

DATE: 12/11/98 COMMENTS: Contact Larry Nadler or Bill Yeman on comments. (Fenley Nicol letter later today)

FROM: Sal Carlomagno

NEW YORK STATE DEPT. OF ENVIRONMENTAL CONSERVATION
BUREAU OF RADIATION AND HAZARDOUS SITE MANAGEMENT

518-457-9361 FAX:(518) 457-9240

Number of pages with cover sheet 5

NYSDEC would like to make the following comments on EPA Region 2's guidance document for satellite accumulation areas:

-------------- comment 1 ----------------

- To be sure the reader understands that this guidance addresses only the special needs of operations such as clean rooms, we suggest that the title be amended as follows:

SATELLITE ACCUMULATION AREAS <u>*FOR CLEAN ROOMS*</u>

------------- comment 2 ----------------

- Footnote 1, below, states that DEC allows 55 gallons per waste stream, not per satellite area. This is <u>not</u> correct. DEC only allows a total of 55 gallons per satellite area (but acknowledges that, per EPA guidance, a generator may have more than one satellite area). Removing the first sentence would correct the footnote.

(footnote 1): NYSDEC has interpreted this to mean 55 gallons per waste stream, not per satellite accumulation area.. However, EPA's Permit Policy Compendium clearly states that "The 55 gallon limit applies to the total of all the non-acutely hazardous waste accumulated at a satellite accumulation area." But "...EPA intentionally did not limit the total number of satellite areas at a generator's facility nor specify the size of the containers to be used for accumulation. A case-by-case analysis is necessary to determine whether a generator is accumulating more than 55 gallons of waste at one satellite area, or whether a generator has more than one satellite area."

------------- comment 3 ------------

- In the guidance's answer to question 1, the following statement is believed to be too broad:

If the waste is accumulated in the common area of the building rather than by the individual processes because of certain safety, production process or quality control requirements, such an arrangement is acceptable.

We believe any policy should be limited to only situations where safety or clean room limitations genuinely require it. Allowing it to apply to meet "production process" requirements and "quality control" requirements would arguably allow virtually any operation with production or QC constraints to qualify. It would "open the flood gates" and make enforcement of the traditional "at-or-near-the-point-of-generation" satellite accumulation area requirement very, very difficult.

--------- comment 4 --------------

- Comment 4: The following paragraph could mistakenly be interpreted to mean that even "traditional" satellite areas need to be locked, and under the "direct" control of the operator. Changing the title as proposed in comment 1 will make it clear that this paragraph (and the entire guidance) applies only to clean room situations, ie, not to "traditional" satellite areas.

The satellite accumulation container must also be under the direct control of the operator or operators. Since the waste container is in a common area, and therefore accessible to persons other than the operators, this is not acceptable as a satellite accumulation area. In order for this to qualify as a satellite accumulation area, the drum must be secured in a manner (a locked cabinet or shed, locked drum, etc.) that would permit access solely to the process operators or other authorized personnel. The placement of such signs as "Authorized Personnel Only" is not sufficient to limit access to the area.

--------- comment 5 -----------------

- Comment 5: We believe that the term "conveyance vessels" as used in the guidance should be reserved for containers used only to <u>immediately</u> transport newly generated hazardous waste to a satellite container, ie, with no storage other than that which is incidental to transport. DEC believes it is misleading to refer to a container that stores hazardous waste for hours (or days) as only a conveyance vessel even though its main purpose would be storage.

  Furthermore, we do not believe that the creation of a new storage option (ie, in small vessels) -- what is perhaps best called "pre-satellite storage" -- is generally allowed by the regs. (It also seems inconsistent with "clean room" requirements. If the satellite area needs to be "outside the door," it should also be unacceptable for small containers, which may even be open, to remain inside. Thus, initial storage in small vessels seems inconsistent with a claim of "clean room.") The existing satellite accumulation provision would address the needs of clean room operators if conveyance is immediate *and* access to an "outside the door" storage unit is strictly controlled, as described previously. (Otherwise, any "drum outside the door" would now need to comply with the 90-day storage requirements, since satellite storage areas are only supposed to be allowed at points where the waste is *initially* accumulated). In fact, it is our understanding that satellite accumulation areas were created for the very purpose of providing relief for wastes where they are initially generated. This is underscored by various statements in the preambles for the satellite accumulation provision. (For example, in the January 3, 1983 Federal Register proposal EPA stated that "...comments indicate[d] that industries which generate hazardous waste typically have numerous locations on-site where waste is initially generated and accumulated, often in small amounts, prior to consolidation at centralized [90-day] areas." p 118)

We believe that the satellite accumulation provision can adequately address the needs of clean rooms and other operations that generate hazardous waste at their processes, and that the creation of a new storage provision is unnecessary and generally not allowable. With one exception -- Dyno Nobel, where serious *safety* constraints demanded a more 'flexible' determination -- DEC has not allowed such "pre-satellite" accumulation of hazardous waste, although we routinely allow vessels to be used to immediately convey newly generated wastes to satellite areas. (In Dyno Nobel's case, we required that the small containers be emptied into the "drum outside the door" at the end of each shift. We do not believe that a longer period could ever be justified.)

Additionally, we would like to request that the reference to "NYSDEC" be removed from footnote 2. As per the above, we generally do not agree with it.

The text of the paragraphs in question is as follows:

2) The small containers used to convey wastes to such a satellite accumulation area may be deemed to be conveyance vessels rather than storage containers. {{footnote 2: Both NJDEP and NYSDEC have taken this position.}} Although not a regulatory requirement, the conveyance vessel should also be under the direct control of the operator of the process generating the waste or must be identified as containing hazardous waste. In other words, the operator must empty the container prior to the end of the operating day. If it is not emptied by the operator prior to the end of the operating day, the conveyance vessel must at a minimum be labeled with the words "Hazardous Waste" and be closed.

If the facility claims that the satellite storage container must be stored outside of the production area for safety, production process or quality control requirements, the removal of such wastes from the generation area should be expected to occur on a regular and frequent basis. Storage of wastes in these containers for more than one or two days should cause the inspector to question the validity of any claim that such wastes have to be stored outside of the area generating the wastes. Storage of wastes in these smaller containers for more than one or two days may qualify these smaller containers as satellite storage containers, making the 55-gallon container a less-than-90-day accumulation area. Similarly, such a claim would be drawn into question if the conveyance vessel is not kept closed or is not vented away from the production area.